# EXHIBIT G

# TO THE DECLARATION OF ARPITA BHATTACHARYYA IN SUPPORT OF ASETEK DANMARK A/S'S MOTION FOR PARTIAL SUMMARY JUDGMENT

# Exhibit B

'284 patent

# Exhibit B-1

Asetek Gen 4 (represented by a Thermaltake Water 3.0 device - P/N CLW0222-B)

'284 Patent Claim **Comparison to Thermaltake** The Thermaltake device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Thermaltake device has a copper heat spreader plate and a housing separable from the pump. 1. A fluid heat exchanger for Thus, the Thermaltake device includes "a cooling an electronic device, the component that transfers heat from a heat source heat exchanger comprising: to a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).



#### '284 Patent Claim

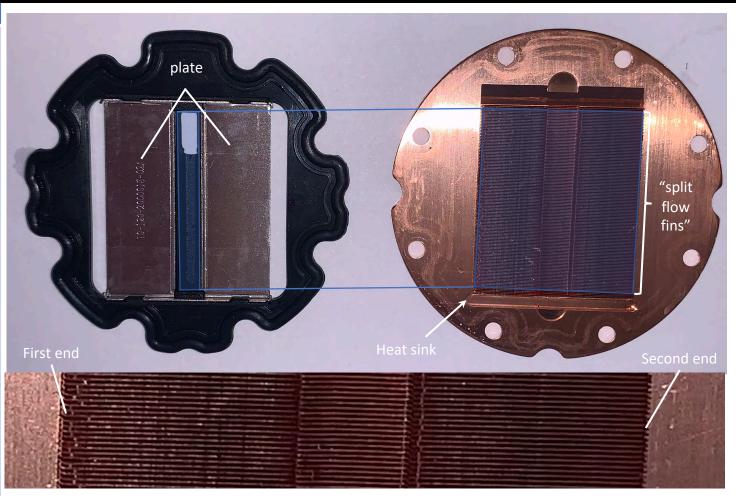
# Comparison to Thermaltake Device The Thermaltake device literally includes more

than one fin, and this group of fins is spaced apart from each other without any intervening

solid structure between them, thus satisfying the plurality of spaced-apart walls limitation. For example, the Thermaltake device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph

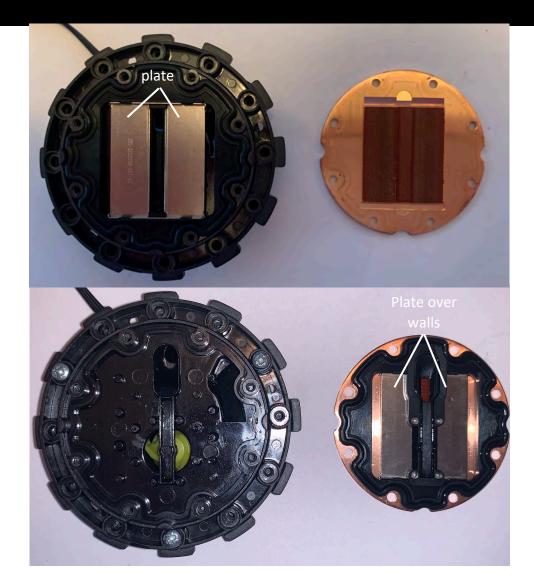
(detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



1[a]. a plurality of spacedapart walls defining a corresponding plurality of microchannels having respective first ends and second ends;

'284 Patent Claim 1[b]	Comparison to Thermaltake
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The top left photo shows the claimed plate and the lower right photo shows it positioned over the plurality of walls, closing off the plurality of microchannels, regardless of which interpretation of plurality of walls is selected (e.g., "splitflow fins" or another group having more than one fin).

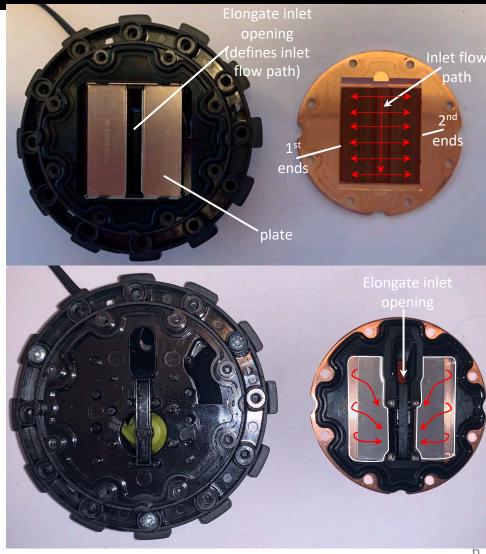


#### '284 Patent Claim 1[b]

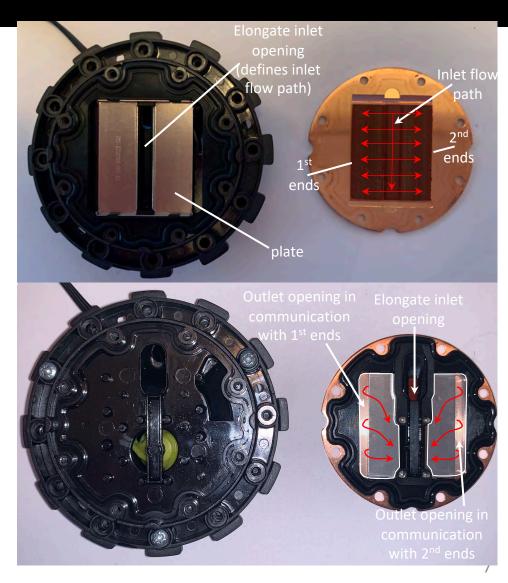
1[c]. an elongate *inlet* opening in fluid communication with each of the microchannels, wherein an inlet flow path to each respective microchannel is positioned between the respective first ends and second ends;

#### **Comparison to Thermaltake**

An elongate inlet opening is oriented transversely to the walls. The elongate inlet opening is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed. The red arrows depict a flow path through the device.



'284 Patent Claim 1[b]	Comparison to Thermaltake
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as the bottom right image shows.  When the plate is positioned over the fins, as in the lower right image, the fluid outlet openings are positioned at each of the microchannel first ends, and opposite outlet openings are positioned at each of the microchannel second ends.  Each fluid outlet opening is defined by the edge of the plate, as shown in the lower right image. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)

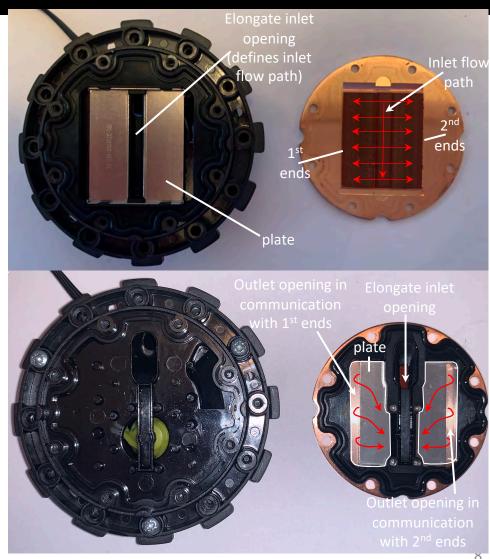


#### '284 Patent Claim 1[b]

1[d][1]. wherein acorresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the *inlet flow path* to the respective microchannel,

#### **Comparison to Thermaltake**

Fluid exiting each microchannel first end (lower right) follows an outlet flow path (indicated by red arrows) positioned laterally outward of the plate relative to the inlet flow path that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red arrow in the upper right image.

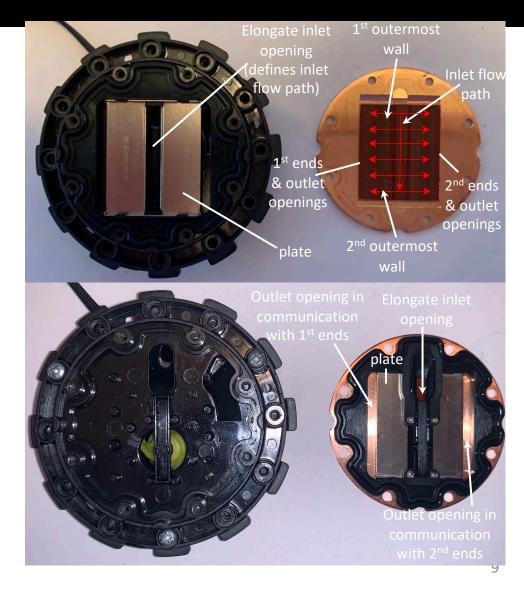


#### '284 Patent Claim 1[c]

1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost wall relative to the plurality of microchannels,

#### **Comparison to Thermaltake**

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image. The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

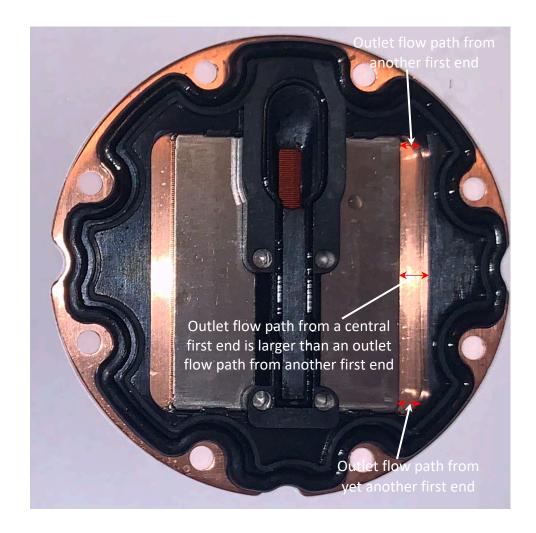


#### '284 Patent Claim 1[c]

1[d][3]. wherein *the* outlet flow path from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

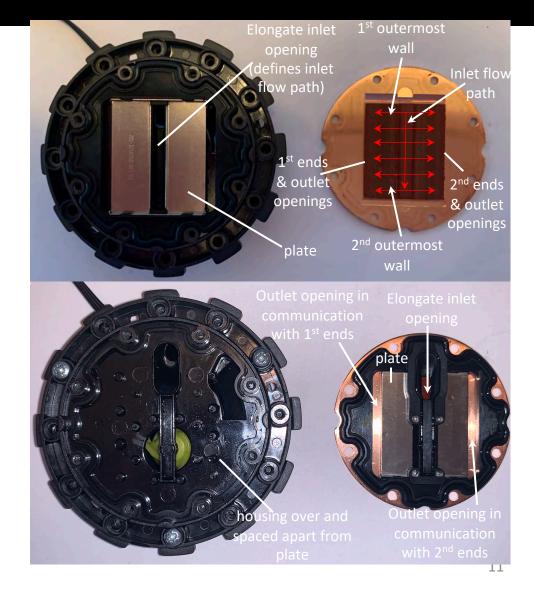
#### **Comparison to Thermaltake**

The image at right shows an outlet flow path from the first end of a centrally positioned microchannel, as well as another outlet flow path from another microchannel positioned adjacent the first outermost wall and yet another outlet flow path from a microchannel positioned adjacent a second outermost wall. As shown to the right, the outlet flow path from the central microchannel is larger than the outlet flow path from the other microchannels (positioned adjacent the outermost walls).



#### '284 Patent Claim 1 [d] **Comparison to Thermaltake** When the fluid heat exchanger is assembled as shown in the photo at upper left, the housing is spaced from the plate that overlies the fins (as shown at lower right) to permit fluid to flow from the outlet openings to the housing outlet. Although some regions of the housing contact the 1[e]. a housing positioned rubber gasket, the housing defines several pillars over and spaced apart from that space the identified housing surface from the the plate, plate to define fluid passageways, e.g., an outlet header region, between the plate and the housing. See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230). 1[e][1]. wherein the housing has an inlet port and an outlet port spaced apart from each other, wherein the inlet port is in fluid communication Each microchannel extends substantially parallel with each respective *inlet* with each other microchannel. Each microchannel *flow path* and the outlet also has a continuous channel flow path between its first end and its opposite end. port is in fluid communication with each respective outlet flow

*path* from the



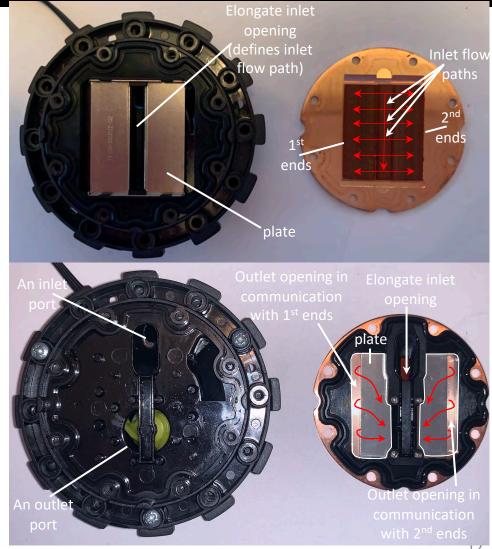
#### '284 Patent Claim 1 [d]

#### Comparison to Thermaltake

1[e][1]. wherein the housing has an inlet port and an outlet port spaced apart from each other, wherein the inlet port is in fluid communication with each respective *inlet flow path* and the outlet port is in fluid communication with each respective *outlet flow path* from the microchannel first ends; and

The housing has an inlet port and an outlet port spaced apart from each other as shown at lower left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the upper right image. For example, the central red arrow indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives coolant that passed through the indicated inlet port, and thus the inlet port is in fluid communication with the path of each flow entering into the microchannels.

Similarly, the outlet port (indicated bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid communication with each outlet flow path from the microchannel first ends. The curved red arrows at bottom right indicate a flow of coolant after exhausting from the microchannel first ends.



#### '284 Patent Claim 1 [d]

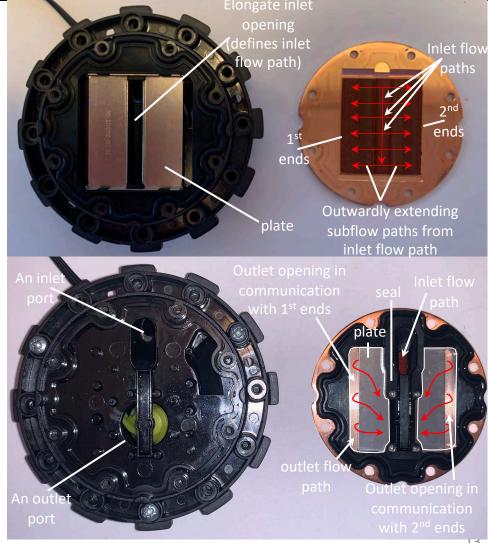
1[f]. *a seal* extending between the housing and the plate and separating *the* inlet flow path to each of the microchannels from the outlet flow path from each of the microchannel first ends,

1[f][1]. wherein each subflow paths, wherein one of the subflow paths the corresponding microchannel first end and passes outwardly of the plate along the outlet *flow path* from the respective microchannel first end.

#### **Comparison to Thermaltake**

The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap. The image at upper left shows the seal engaged with the housing and the image at upper right shows the inlet flow paths and FIG. 5 shows the outlet flow paths. The seal (lower right) separates the inlet flow paths from the outlet flow paths.

The upper right image shows each flow of coolant respective *inlet flow path* entering a microchannel bifurcates (splits) into two is split generally into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two extends outwardly toward two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.



Comparison to Thermaltake

3. A fluid heat exchanger according to claim 1, wherein the two subflow paths are directed away from each other.

The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the upper right image.



#### '284 Patent Claim

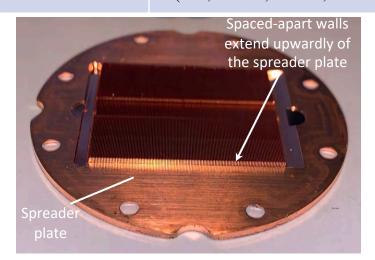
# 4. A fluid heat exchanger according to claim 1, further comprising a spreader plate, wherein the plurality of spaced-apart walls extends upwardly of the spreader plate, wherein the housing contacts the spreader plate.

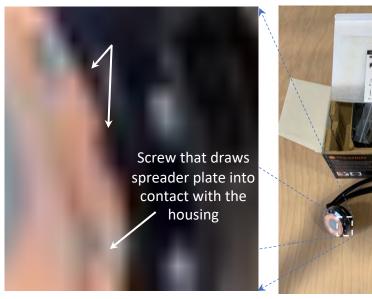
#### **Comparison to Thermaltake**

The image below shows the plurality of spacedapart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.

The image to the right shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing (e.g., the stud).

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)





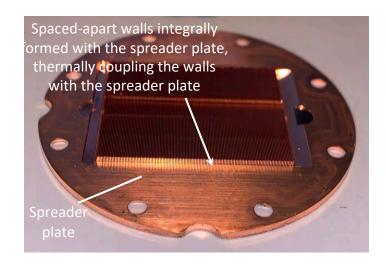


#### '284 Patent Claim

5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spacedapart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

#### **Comparison to Thermaltake**

The image below shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall. The image at lower right shows the outlet flow paths extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate overlying the walls on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.





'284 Patent Claim **Comparison to Thermaltake** The Thermaltake device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Thermaltake device has a copper heat spreader plate and a housing 15. A fluid heat exchanger for separable from the pump. Thus, the Thermaltake device includes "a component that transfers heat cooling an electronic device, the heat exchanger from a heat source to a cooling liquid circulated by comprising: a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).



# '567 Patent - Claim 15

#### '567 Patent Claim

15[a]. a plurality

of walls defining a

corresponding plurality of

microchannels

extending from

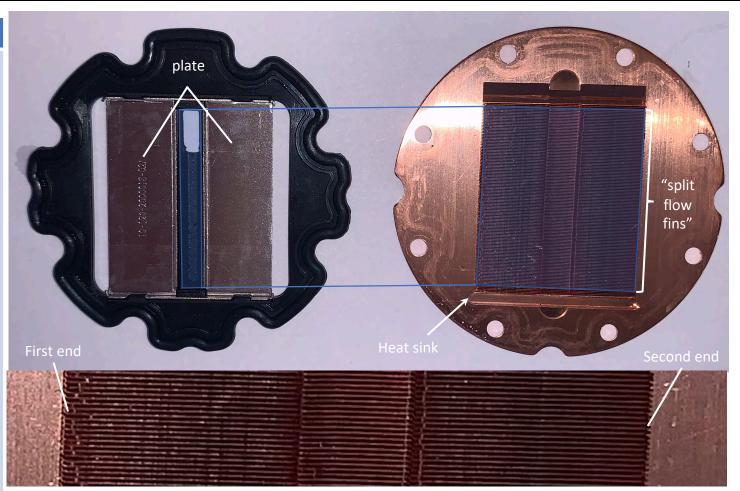
respective first ends to respective

second ends:

#### **Comparison to Thermaltake Device**

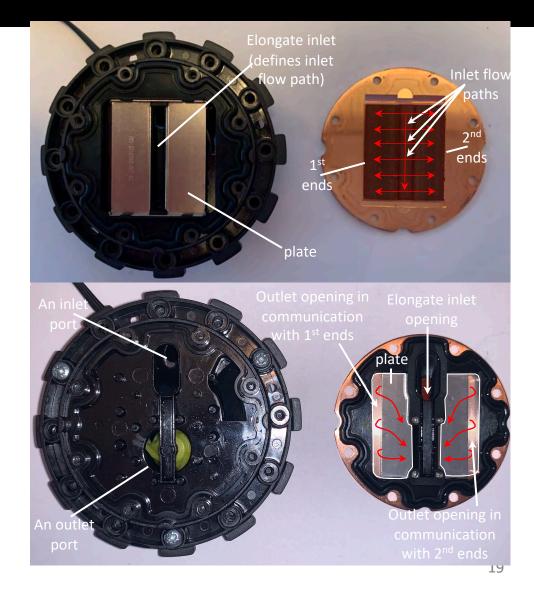
The Thermaltake device literally includes more than one wall with spacing between the walls define a corresponding plurality of "channels with widths up to 1 millimeter." Thus, the Thermaltake device satisfies the plurality of walls limitation. For example, the Thermaltake device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. Further, each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



**Comparison to Thermaltake** As shown in the top left image, the thermaltake fluid heat exchanger has an elongate inlet that 15[b]. an elongate *inlet* opens overtop the microchannels and defines an opening to the microchannels and defining an inlet flow inlet flow path to each microchannel (e.g., *path* to each respective intersection of vertical and horizontal red arrows) at microchannel at a position a position between each microchannel's first end between the respective first and second end. Coolant flows along this inlet flow ends and the respective path into each microchannel and bifurcates into outwardly directed subflows, as the double-ended second ends; red arrows in the upper right image indicate.

'284 Patent Claim

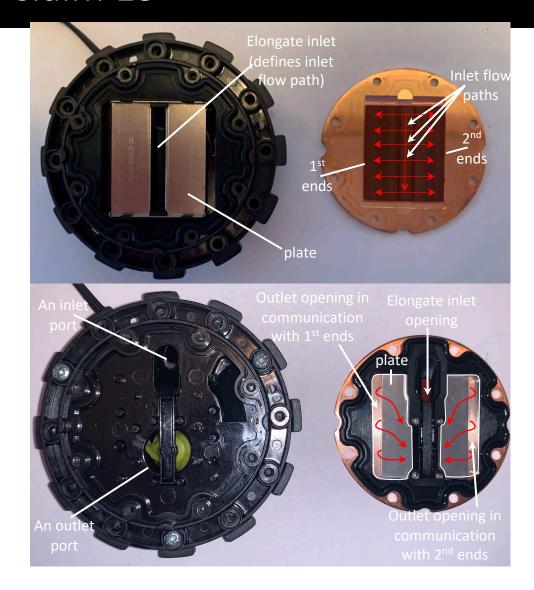


#### '284 Patent Claim

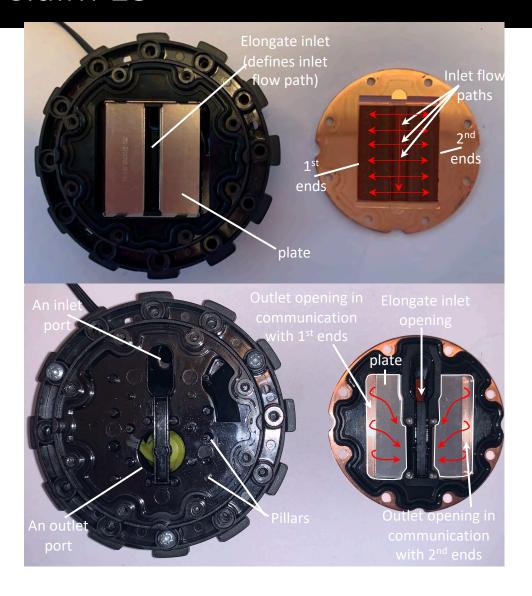
15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow *path* and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective inlet flow path and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end;

#### **Comparison to Thermaltake**

The upper left image shows the claimed plate and the lower right image shows it positioned over the plurality of walls, closing off each microchannel between the inlet flow path and the outlet flow path from the microchannel (e.g., between the elongate inlet and the microchannel 1st ends, and between the elongate inlet and the microchannel 2<sup>nd</sup> ends). In the lower right image, the curved red arrows indicate the path that liquid follows after exiting the microchannel ends. The lower right image also shows the plate that closes off the microchannels by overlying the walls. The lower right image further shows the outlet flow paths positioned outward of the plate and extending from the microchannel first ends and from the microchannel second ends, as claimed.



'284 Patent Claim	Comparison to Thermaltake
	The upper left image shows the plate and seal
	engaged with the housing. The lower left image
	shows the housing and the lower right image shows
	the plate overtop the walls of the heat spreader. As
15[d]. a housing positioned	indicated by the curved red arrows at lower right,
over and spaced apart from	the housing is spaced from the plate, defining a gap
the plate, wherein the	through which coolant can flow from the ends of
housing has an inlet port and	the microchannels to the outlet port (lower left).
an outlet port spaced apart	Accordingly, the housing is spaced from the plate.
from each other; and	Note also the pillars at lower left ensure the gap
	exists between the plate and the housing to permit
	fluid to flow from the outlet openings in fluid
	communication with each microchannel to the
	housing's outlet port.

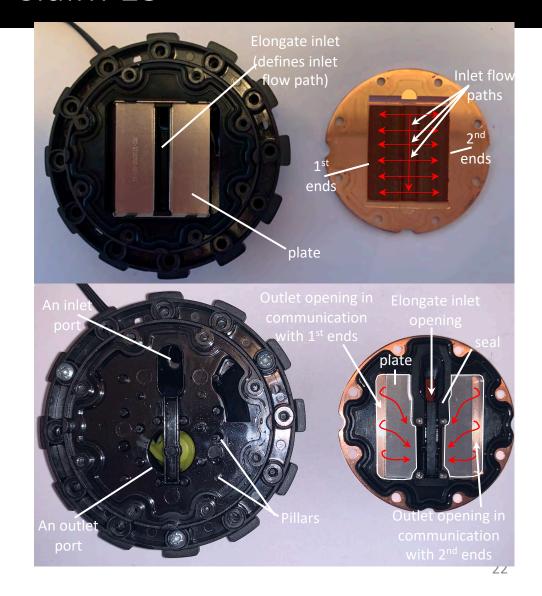


#### '284 Patent Claim

15[e]. a *seal* extending between the housing and the *flow path* to each respective microchannel from both corresponding outlet flow *paths* from the respective microchannel, wherein each respective inlet each respective *flow path* splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow paths extends outwardly toward the corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding microchannel second end, wherein the subflow path toward the microchannel first end passes from the respective first end along the corresponding outlet flow path e,

#### **Comparison to Thermaltake**

The lower right image shows the claimed seal that extends between the plate and the housing, plate and separating the *inlet* separating the inlet flow paths from the outlet flow paths. The upper left image shows the seal engaged with the housing and the lower right image shows the seal and plate overlying the walls. The upper right image shows the inlet flow paths and the lower right image shows the outlet flow paths. As shown, the seal separates the inlet flow paths (upper right) from the outlet flow paths (lower right). The upper right image shows that each inlet flow path splits into two subflow paths after entering the corresponding microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The lower right image shows that the subflow of coolant directed toward the first end exits from the microchannel along that microchannel's first outlet flow path, and that the subflow of coolant directed toward the second end exits from the microchannel along that microchannel's second outlet flow path. FIGS. 5A and 5B show that the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end that is spaced apart from the central first end.

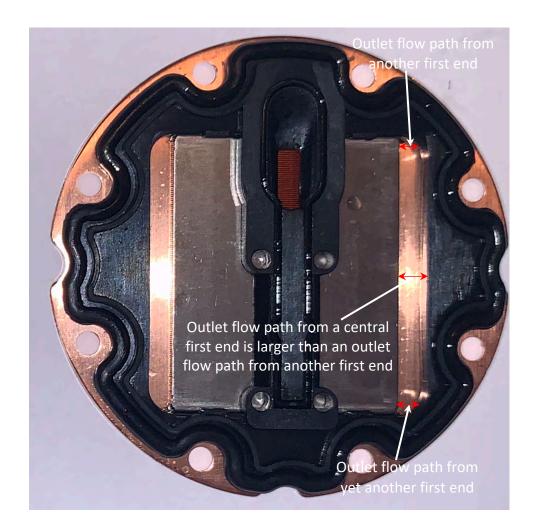


#### '284 Patent Claim

15[e][1]. wherein *the outlet flow path* from a centrally located first end is larger than the *outlet flow path* from a first end spaced apart from the centrally located first end..

#### **Comparison to Thermaltake**

The image to the right shows that the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end that is spaced apart from the central first end.



#### '284 Patent Claim

# 19. A fluid heat exchanger according to claim 15, further comprising a spreader plate, wherein the plurality of walls extends upwardly of the spreader plate and the housing contacts the spreader plate.

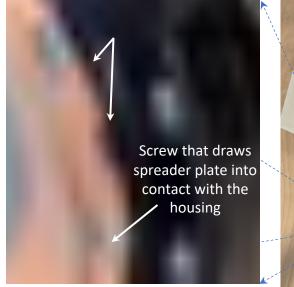
20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls.

#### **Comparison to Thermaltake**

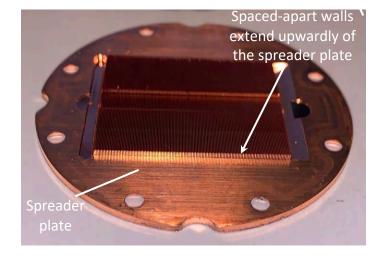
The lower left image shows the heat spreader plate and its walls extending upwardly. As shown at top left, the housing has a side wall that extends downwardly over the walls and contacts the spreader plate.

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)

The lower left image shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.









# Exhibit B-2

Asetek Gen 5 (represented by a Corsair H80i V2 device)

#### '284 Patent Claim

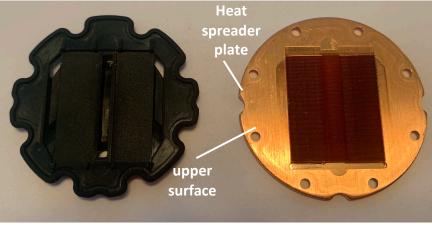
#### Comparison to the H80i V2

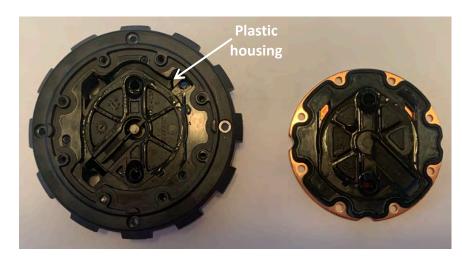
the heat exchanger comprising:

The H80i V2 device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the H80i V2 device has a 1. A fluid heat exchanger for copper heat spreader plate and a housing separable cooling an electronic device, from the pump. Thus, the H80i V2 includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).







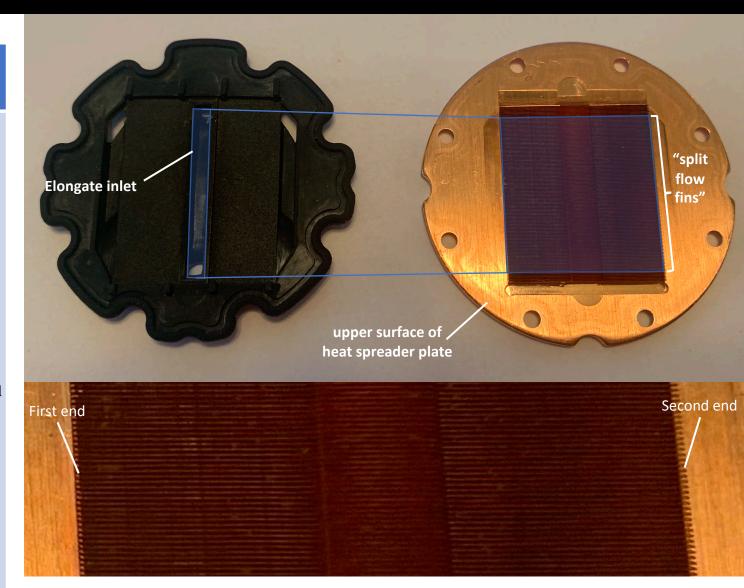


#### '284 Patent Claim

#### Comparison to the H80i V2

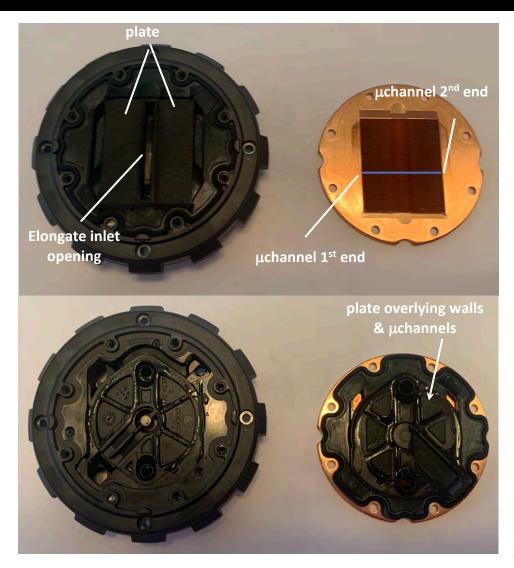
The H80i V2 device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them. For example, rhe H80i V2 has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



1[a]. a plurality of spacedapart walls defining a corresponding plurality of microchannels having respective first ends and second ends;

'284 Patent Claim	Comparison to the H80i V2
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The top left photo shows the claimed plate and the lower right photo shows it positioned over the plurality of walls, closing off the plurality of microchannels, regardless of which interpretation of plurality of walls is selected (e.g., "splitflow fins," or another group having more than one fin).

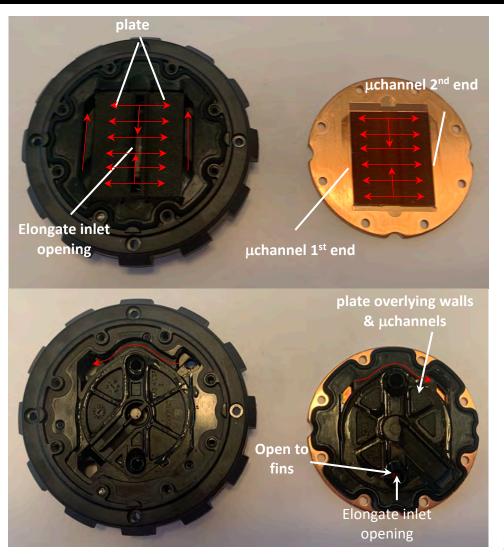


#### '284 Patent Claim

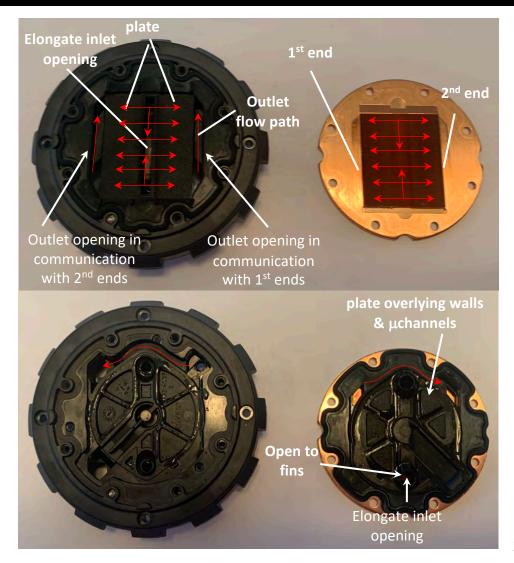
# 1[c]. an elongate *inlet opening* in fluid communication with each of the microchannels, wherein *an inlet flow path* to each respective microchannel is positioned between the respective first ends and second ends;

#### Comparison to the H80i V2

An elongate inlet opening defined by the plate is oriented transversely to the walls when assembled with the plate, as in the lower right image. The elongate inlet opening is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed. The red arrows depict a flow path through the device.



'284 Patent Claim	Comparison to the H80i V2
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	Each microchannel has a first end and an opposed second end, as shown at top right. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown in at top left.  When the plate is positioned over the fins, as in the image at bottom right, on fluid outlet openings is positioned across the microchannel first ends, and the other outlet opening is positioned across the microchannel second ends.  Each fluid outlet opening is defined by the edge of the plate, as shown at upper left. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)
1[d][1]. wherein a corresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the inlet flow path to the respective microchannel,	Fluid exiting each microchannel first end follows an outlet flow path (indicated by red arrows at upper left) positioned laterally outward of the plate relative to the inlet flow path that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red arrows.

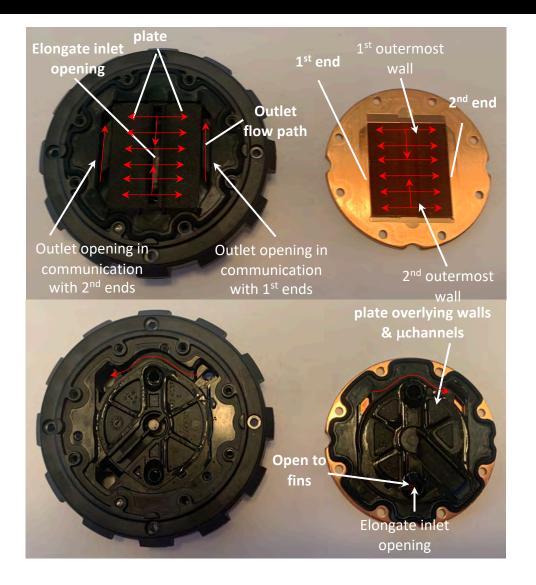


#### '284 Patent Claim

1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost wall relative to the plurality of microchannels,

#### Comparison to the H80i V2

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image. The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

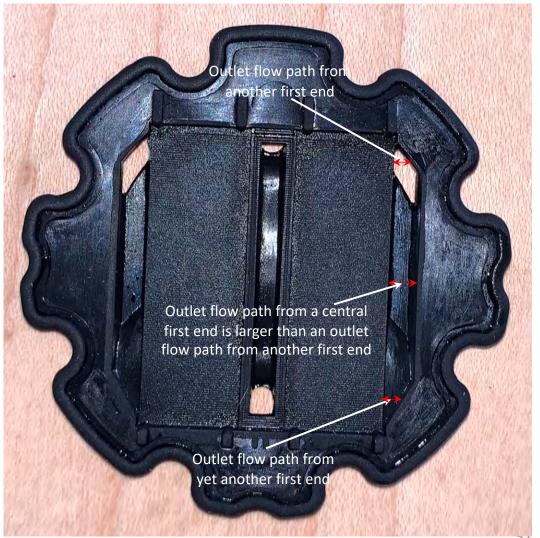


#### '284 Patent Claim

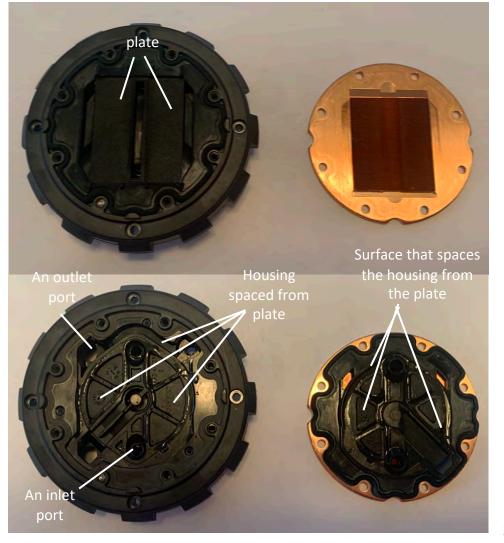
1[d][3]. wherein *the outlet flow path* from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than *the outlet flow path* from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

#### Comparison to the H80i V2

The image at right shows an outlet flow path from the first end of a centrally positioned microchannel, as well as another outlet flow path from another microchannel positioned adjacent the first outermost wall and yet another outlet flow path from a microchannel positioned adjacent a second outermost wall. As shown to the right, the outlet flow path from the central microchannel is larger than the outlet flow path from the other microchannels (positioned adjacent the outermost walls).



'284 Patent Claim	Comparison to the H80i V2
1[e]. a housing positioned over and spaced apart from the plate,	When the fluid heat exchanger is assembled as shown in the photo at upper left, the housing is spaced from the plate that overlies the fins (as shown at lower right), permitting fluid to flow from the outlet openings to the housing outlet.  Although some regions of the housing contact the rubber gasket, the housing defines several ribs that space the identified housing surface from the plate to define fluid passageways, e.g., an outlet header region, between the plate and the housing. See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges
	against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).

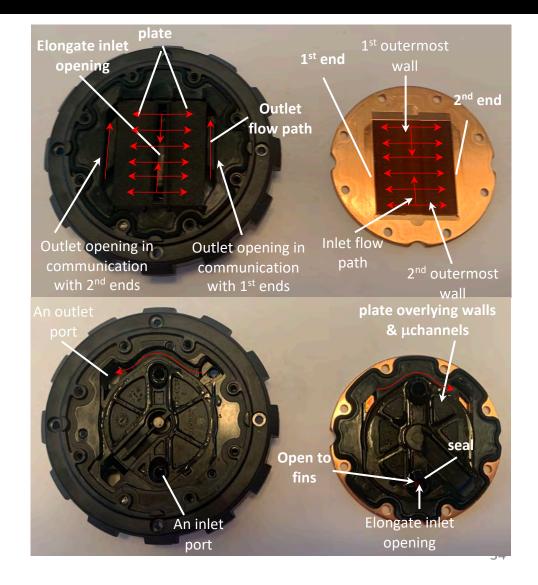


#### '284 Patent Claim

#### Comparison to the H80i V2

The housing has an inlet port and an outlet port spaced apart from each other as shown at lower left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the upper right image. For example, the central red arrow indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. The inlet port is in fluid communication with the path of each flow entering into the microchannels (e.g., variation in pressure at the inlet port will affect the pressure in the coolant through each microchannel).

Similarly, the outlet port (indicated bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid communication with each outlet flow path from the microchannel first ends. The curved red arrows at bottom right indicate a flow of coolant after exhausting from the microchannel first ends.



1[e][1]. wherein the housing has an inlet port and an outlet port spaced apart from each other, wherein the inlet port is in fluid communication with each respective *inlet flow path* and the outlet port is in fluid communication with each respective *outlet flow path* from the microchannel first ends;

and

#### '284 Patent Claim

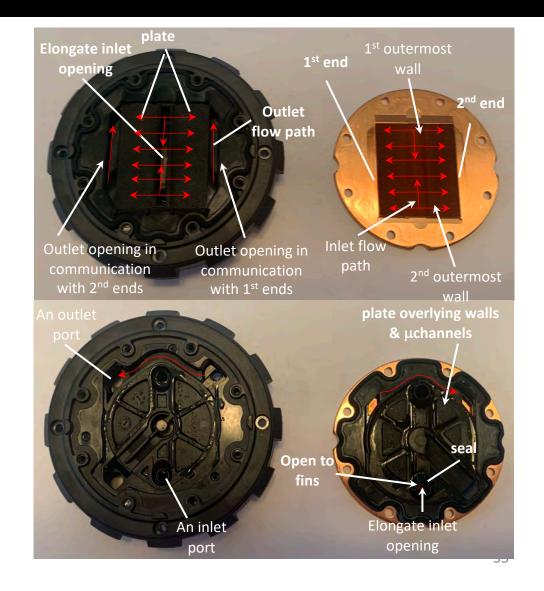
1[f]. *a seal* extending between the housing and the plate and separating *the inlet flow path* to each of the microchannels from *the outlet flow path* from each of the microchannel first ends.

1[f][1]. wherein each respective *inlet flow path* is split generally into two subflow paths, wherein one of the subflow paths extends outwardly toward the corresponding microchannel first end and passes outwardly of the plate along *the outlet flow path* from the respective microchannel first end.

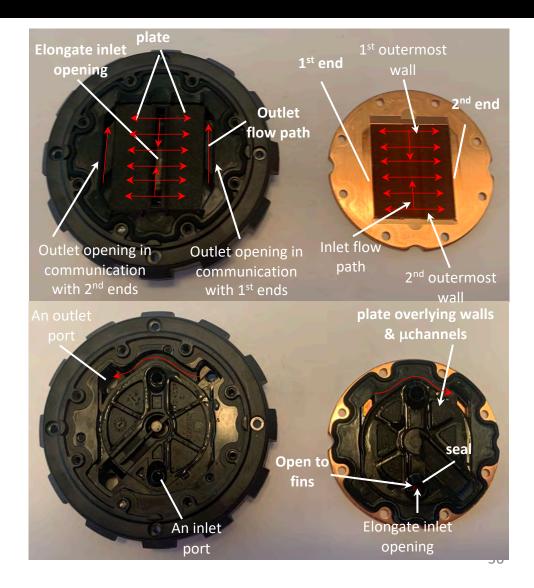
#### Comparison to the H80i V2

The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap when the plate / seal is assembled with the housing as in the upper left. The image at upper left shows the seal engaged with the housing and the outlet flow paths, while the image at upper right shows the inlet flow paths. The seal (lower right) separates the inlet flow paths from the outlet flow paths.

The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.



'284 Patent Claim	Comparison to the H80i V2
3. A fluid heat exchanger according to claim 1, wherein the two subflow paths are directed away from each other.	The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the upper right image.



#### '284 Patent Claim

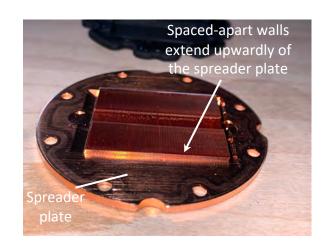
4. A fluid heat exchanger according to claim 1, further comprising a spreader plate, wherein the plurality of spaced-apart walls extends upwardly of the spreader plate, wherein the housing contacts the spreader plate.

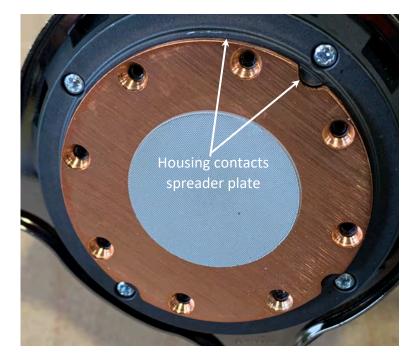
#### Comparison to the H80i V2

The image below shows the plurality of spacedapart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.

The image to the right shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing (e.g., the stud).

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)







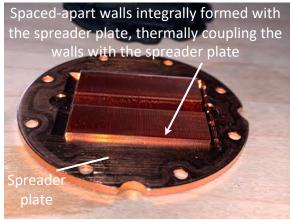


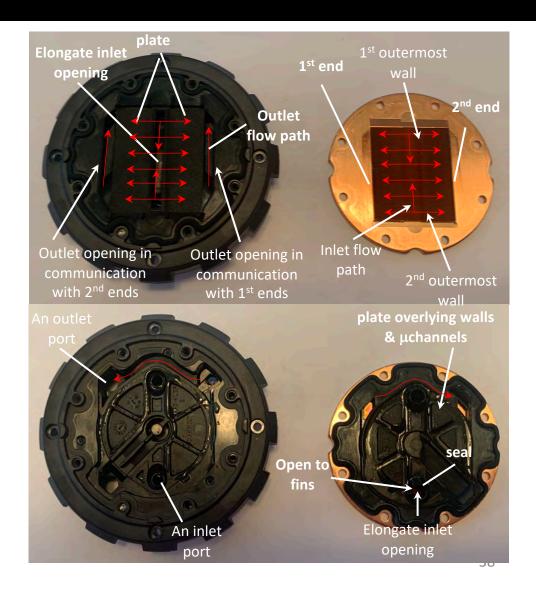
#### '284 Patent Claim

5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spacedapart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

#### Comparison to the H80i V2

The image below shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall. The images at upper left, lower left and lower right show the outlet flow paths (red arrows) extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate overlying the walls on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.





#### '284 Patent Claim

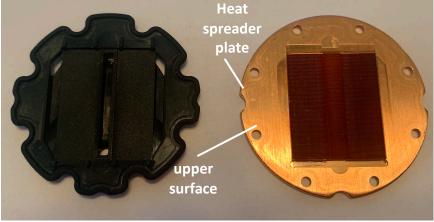
#### Comparison to the H80i V2

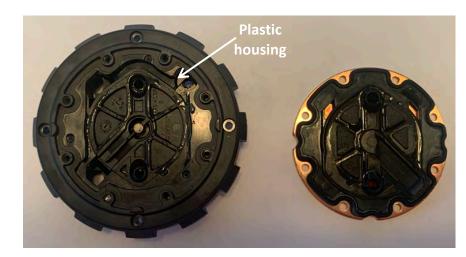
15. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:

The H80i V2 device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the H80i V2 device has a copper heat spreader plate and a housing separable from the pump. Thus, the H80i V2 includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).









#### '284 Patent Claim

15[a]. a plurality of walls

defining a corresponding

plurality of microchannels

extending from respective

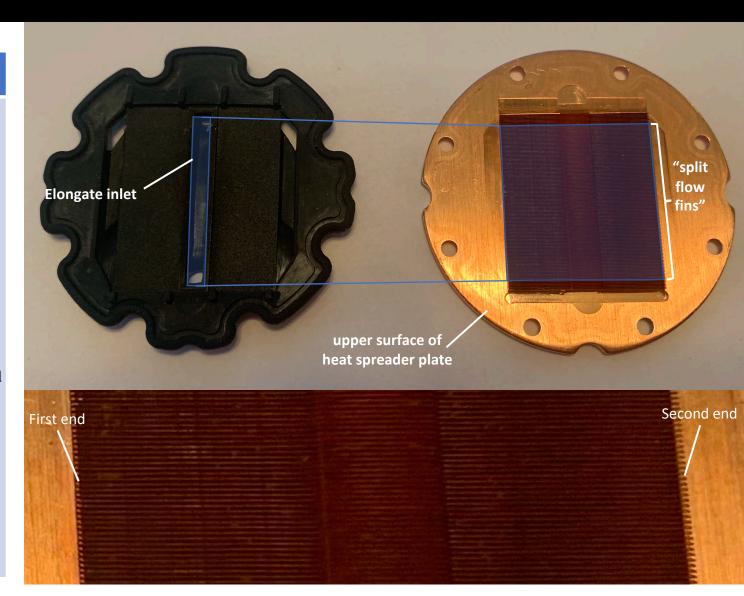
first ends to respective

second ends;

#### Comparison to the H80i V2

The H80i V2 device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them. For example, the H80i V2 has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

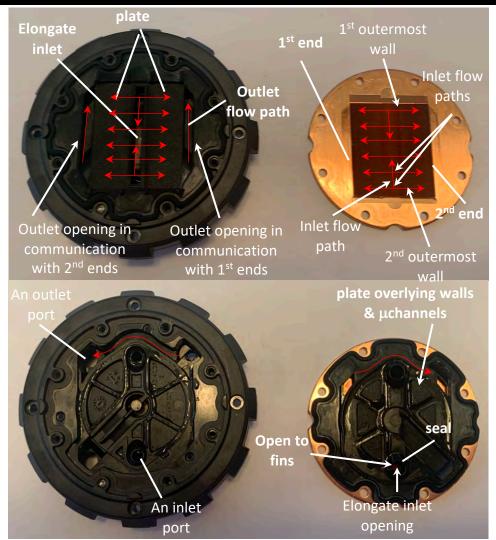


#### '284 Patent Claim

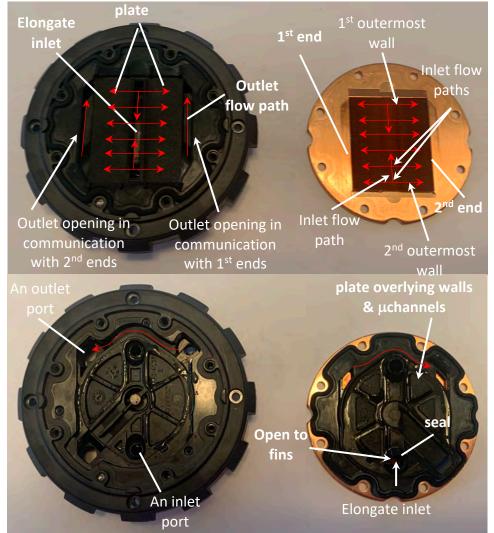
15[b]. an elongate *inlet* and defining an inlet flow path to each respective microchannel at a position between the respective first ends and the respective second ends;

#### Comparison to the H80i V2

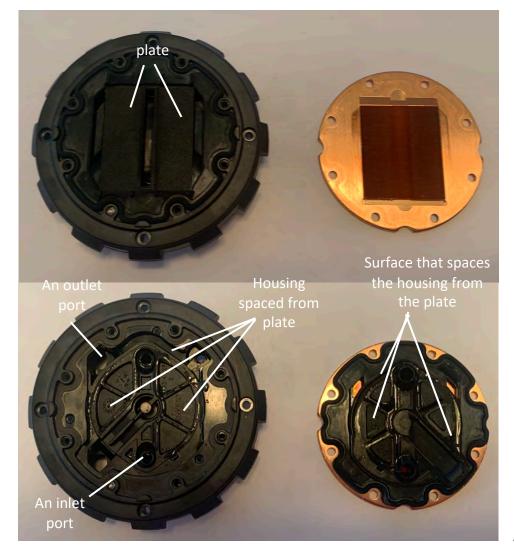
As shown in the top left image, the H80i V2's fluid heat exchanger has an elongate inlet that opens opening to the microchannels overtop the microchannels and defines an inlet flow path to each microchannel (e.g., intersection of vertical and horizontal red arrows) at a position between each microchannel's first end and second end. Coolant flows along this inlet flow path into each microchannel and bifurcates into outwardly directed subflows, as the double-ended red arrows in the upper right image indicate.



#### '284 Patent Claim Comparison to the H80i V2 15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow The upper left image shows the claimed plate and *path* and a corresponding the lower right image shows it positioned over the plurality of walls, closing off each microchannel outlet flow path positioned outward of the plate and between the inlet flow path and the outlet flow path extending from the from the microchannel (e.g., between the elongate inlet and the microchannel 1st ends, and between the respective microchannel elongate inlet and the microchannel 2<sup>nd</sup> ends). In adjacent the corresponding the upper left image (the upwardly directed) and the first end, and wherein the plate is positioned over the lower images (the curved), the red arrows indicate plurality of walls to close off fluid flow after exiting the microchannels. The lower images also show the plate that closes off the the plurality of microchannels between each microchannels by overlying the walls. The upper right image further shows the outlet flow paths respective inlet flow path and a corresponding *opposed* positioned outward of the plate and extending from outlet flow path positioned the microchannel first ends and from the outward of the plate and microchannel second ends, as claimed. extending from the respective microchannel adjacent the corresponding second end;



'284 Patent Claim	Comparison to the H80i V2
15[d]. a housing positioned over and spaced apart from the plate, wherein the housing has an inlet port and an outlet port spaced apart from each other; and	When the housing and the plate are assembled as shown in the photo at upper left, the housing is spaced from the plate that overlies the fins (as shown at lower right), permitting fluid to flow from the outlets that open from the microchannels to the housing outlet port.  Although some regions of the housing contact the rubber gasket, the housing defines several ribs that space the identified housing surface from the plate to define fluid passageways, e.g., an outlet header region, between the plate and the housing. See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).

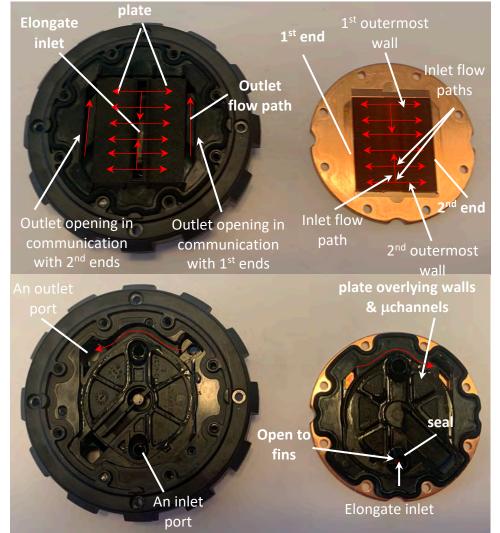


#### '284 Patent Claim

#### Comparison to the H80i V2

15[e]. a *seal* extending between the housing and the plate and separating the inlet flow path to each respective microchannel from both corresponding outlet flow *paths* from the respective microchannel, wherein each respective inlet each respective flow path splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding microchannel second end, wherein the subflow path toward the microchannel first end passes from the respective first end along the corresponding outlet flow path e,

The lower right image shows the claimed seal that extends between the plate and the housing, separating the inlet flow paths from the outlet flow paths. The upper left image shows the seal engaged with the housing and the lower right image shows the seal and plate overlying the walls. The upper right image shows the inlet flow paths and the lower right image shows the outlet flow paths. As shown, the seal separates the inlet flow paths (upper right) from the outlet flow paths (lower right). The upper right image shows that each inlet flow path splits into two subflow paths extends outwardly toward the paths after entering the corresponding microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The lower right image shows that the subflow of coolant directed toward the first end exits from the microchannel along that microchannel's first outlet flow path, and that the subflow of coolant directed toward the second end exits from the microchannel along that microchannel's second outlet flow path.



# '284 Patent ClaimComparison to the H80i V215[e][1]. wherein the outlet<br/>flow path from a centrally<br/>located first end is larger than<br/>the outlet flow path from a first<br/>end spaced apart from theThe image to the right shows that the outlet flow<br/>path from a centrally located first end is larger<br/>than the outlet flow path from a first end that is<br/>spaced apart from the central first end.

centrally located first end.



# '284 Patent – Claims 19 and 20

#### '284 Patent Claim

# 19. A fluid heat exchanger according to claim 15, further comprising a spreader plate, wherein the plurality of walls extends upwardly of the spreader plate and the housing contacts the spreader plate.

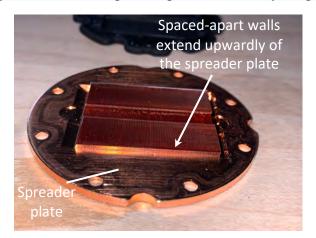
20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls.

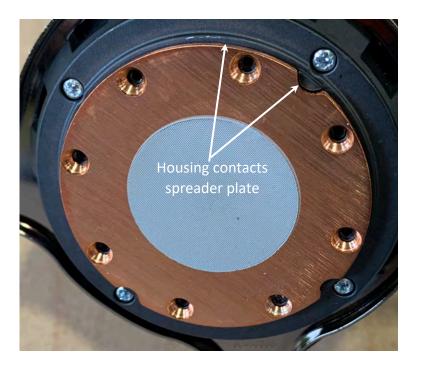
#### Comparison to the H80i V2

The images to the right show the heat spreader plate and the housing of the H80i V2. The image below shows the heat spreader plate with the walls extending upwardly from the heat spreader plate. As show to the immediate right, the housing has a side wall that extends downwardly over the walls and contacts the spreader plate.

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)

The image below show the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.









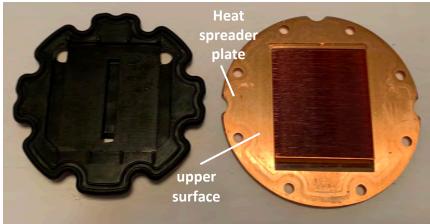
# Exhibit B-3

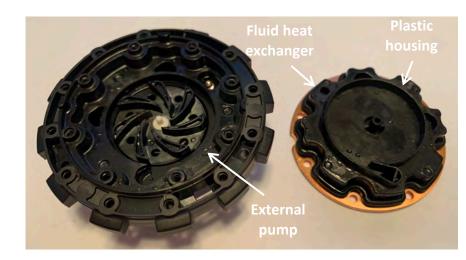
Asetek Gen 6 (represented by a ROG STRIX LC 120 device)

'284 Patent Claim **Comparison to ROG Device** The ROG device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the ROG device has a 1. A fluid heat exchanger for copper heat spreader plate and a housing separable cooling an electronic device, from the pump. Thus, the ROG device includes "a the heat exchanger component that transfers heat from a heat source to comprising: a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).









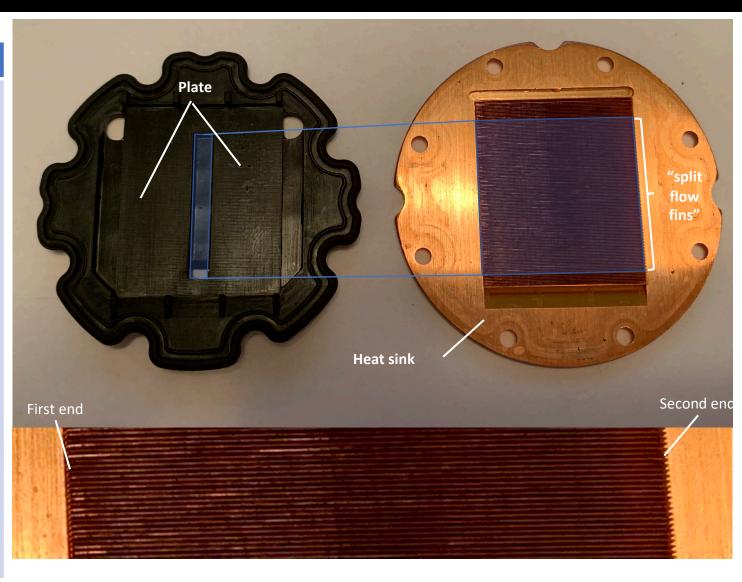
'284 Patent Claim

1[a]. a plurality of spacedapart walls defining a corresponding plurality of microchannels having respective first ends and second ends;

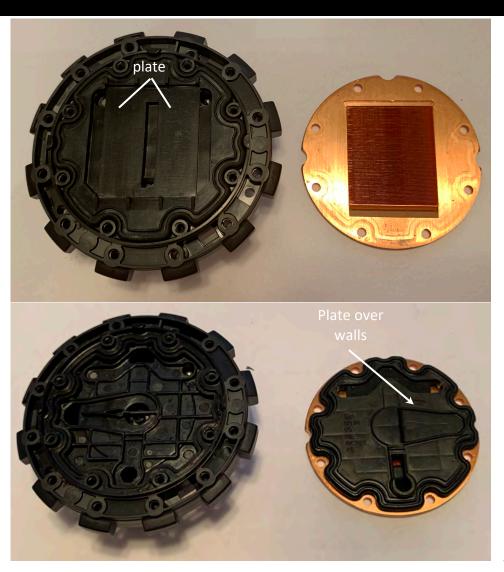
#### **Comparison to ROG Device**

The ROG device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them. For example, the ROG device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



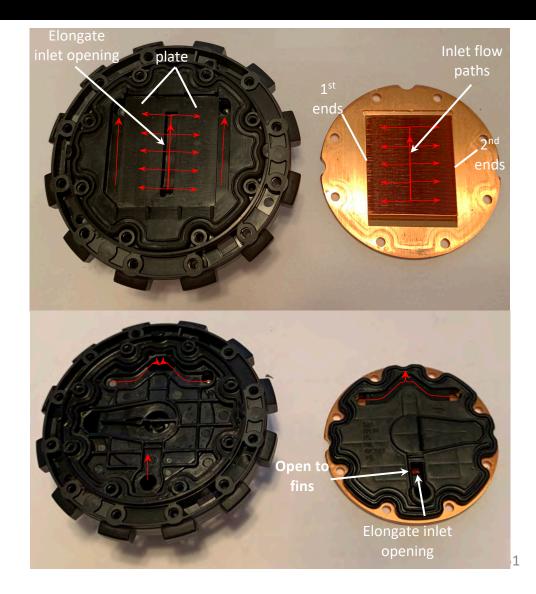
'284 Patent Claim	Comparison to ROG Device
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The top left photo shows the claimed plate and the lower right photo shows it positioned over the plurality of walls, closing off the plurality of microchannels, regardless of which interpretation of plurality of walls is selected (e.g., "splitflow fins," or another group having more than one fin).



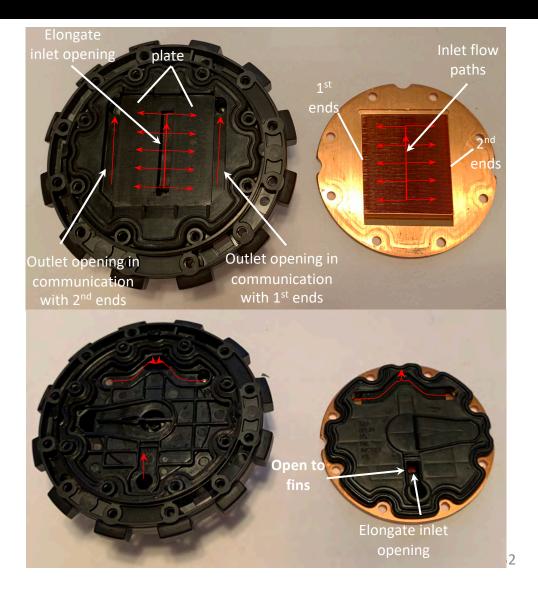
### '284 Patent Claim Comparison to ROG Device

1[c]. an elongate *inlet opening* in fluid
communication with each
of the microchannels,
wherein *an inlet flow path*to each respective
microchannel is positioned
between the respective first
ends and second ends;

The upper left image shows the plate defines an elongate inlet opening oriented transversely to the walls and in fluid communication with each of the microchannels. The upper right image also shows that the elongate inlet opening is in fluid communication with each of the plurality of micro channels at a position between the first ends of the microchannels and the second ends of the microchannels, defining an inlet flow path (indicated by central red arrow) to each microchannel, as claimed, between the first ends and the second ends of the microchannels.



'284 Patent Claim	Comparison to ROG Device
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown at upper left.  When the plate is positioned over the fins (e.g., lower right), the indicated fluid outlet openings are positioned at each of the microchannel first ends, and the opposite outlet openings are positioned at each of the microchannel second ends.  Each fluid outlet opening is defined by the edge of the plate, as shown in FIG. 5. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)

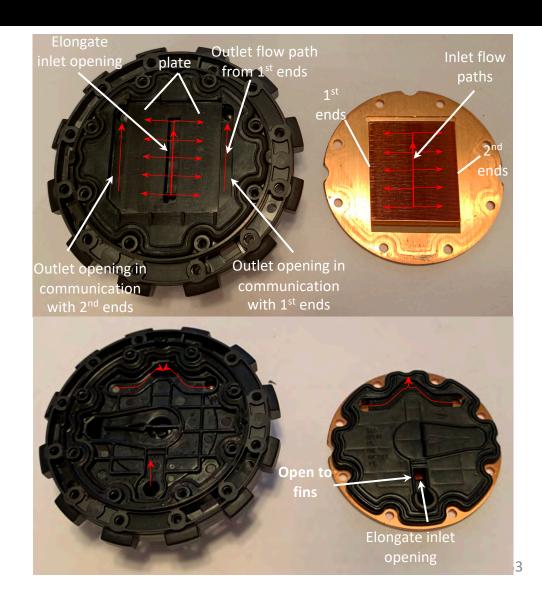


#### '284 Patent Claim

1[d][1]. wherein a corresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the inlet flow path to the respective microchannel,

#### **Comparison to ROG Device**

Fluid exiting each microchannel first end (upper left, upper right) follows an outlet flow path (indicated by red arrows at upper left) positioned laterally outward of the plate relative to the inlet flow path (central red arrow) that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red arrow.



#### '284 Patent Claim

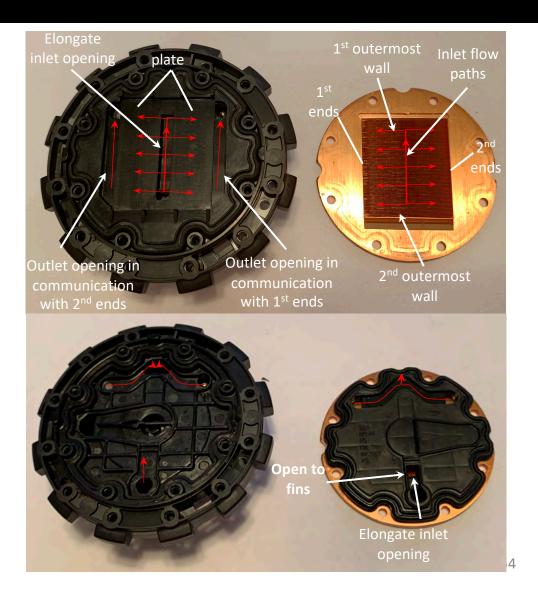
#### 1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first

the plurality of

microchannels,

#### **Comparison to ROG Device**

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image. The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of outermost wall relative to microchannels defined by the selected plurality of walls.

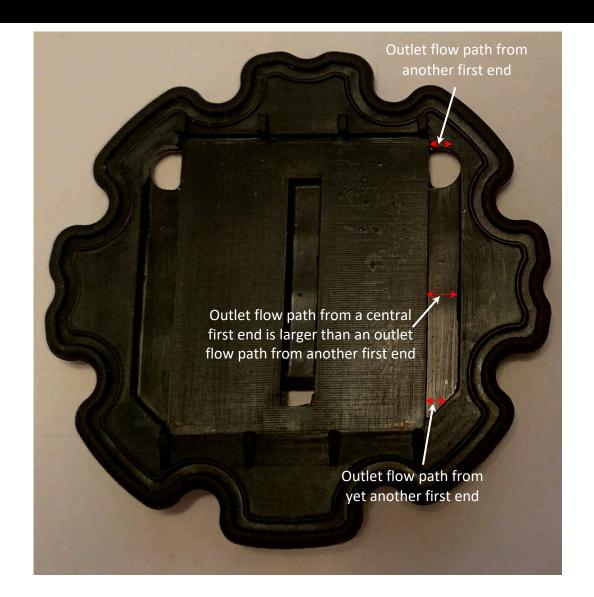


#### '284 Patent Claim

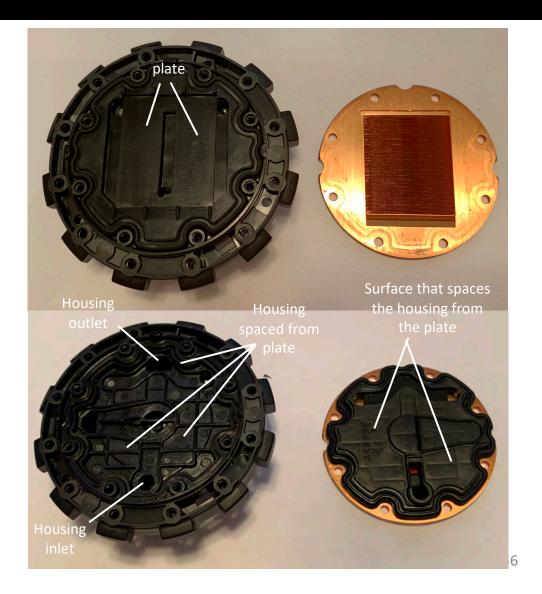
1[d][3]. wherein *the outlet* flow path from a centrally end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

#### **Comparison to ROG Device**

positioned microchannel first The image to the right shows a close-up view of the plate and additional structure, including an outlet flow path from the first end of a centrally positioned microchannel and from another microchannel positioned adjacent the first outermost wall. As shown, the outlet flow path from the central microchannel is larger than the outlet flow path from another microchannel.



'284 Patent Claim	Comparison to ROG Device
1[e]. a housing positioned over and spaced apart from the plate,	When the plate is assembled with the housing (top, left), portions of the housing are spaced from the plate (indicated bottom left). For example, the housing defines a web of ribs with intermediate recesses. A major surface of the insert defining the plate (indicated lower right) rest against and overlie the ribs of the housing, spacing the plate from the housing. Further, other recesses in the housing define passages through which the coolant flows, and thus those regions of the housing must be spaced from the plate.  See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).



# 1[e][1]. wherein the housing has an inlet port and an outlet port spaced apart from each other, wherein the inlet port is in fluid communication

'284 Patent Claim

*flow path* and the outlet

respective *outlet flow* 

microchannel first ends;

port is in fluid

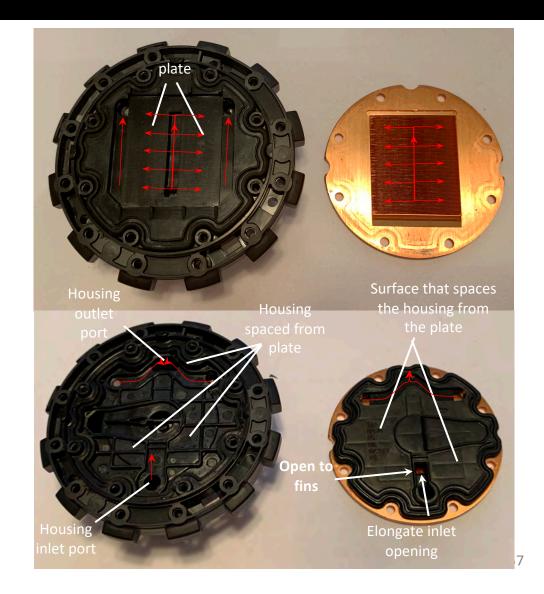
*path* from the

and

#### **Comparison to ROG Device**

The housing has an inlet port and an outlet port spaced apart from each other as shown at lower left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the upper right image. (See also lower right image direct fluid connection between inlet port and elongate inlet opening). For example, the central red arrow indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives coolant that passed through the indicated inlet port, and thus the inlet port is in fluid communication with the path of each flow entering into the microchannels.

with each respective *inlet* Similarly, the outlet port (indicated bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid communication communication with each with each outlet flow path from the microchannel first ends. The straight red arrows at upper left and the curved red arrows at bottom right indicate a flow of coolant after exhausting from the microchannel first ends.



#### '284 Patent Claim

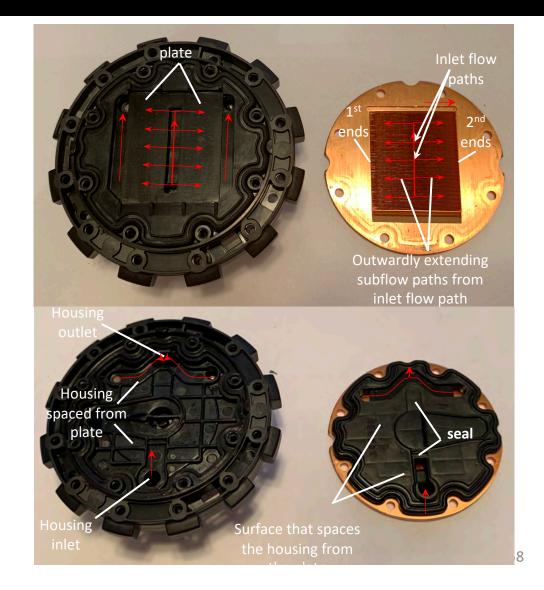
#### **Comparison to ROG Device**

1[f]. *a seal* extending between the housing and the plate and separating *the inlet flow path* to each of the microchannels from *the outlet flow path* from each of the microchannel first ends,

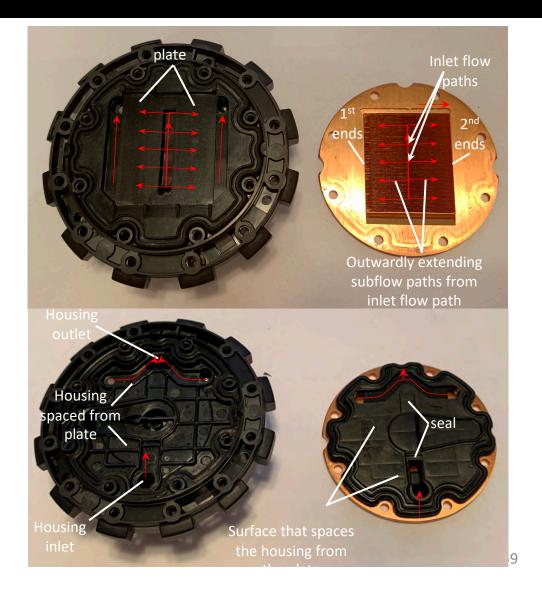
The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap. The image at upper left shows the seal engaged with the housing and the image at upper right shows the inlet flow paths and both bottom images show the outlet flow paths. The seal (lower right) separates the inlet flow paths from the outlet flow paths.

1[f][1]. wherein each respective *inlet flow path* is split generally into two subflow paths, wherein one of the subflow paths extends outwardly toward the corresponding microchannel first end and passes outwardly of the plate along *the outlet flow path* from the respective microchannel first end.

The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.



'284 Patent Claim	Comparison to ROG Device
3. A fluid heat exchanger according to claim 1, wherein the two subflow paths are directed away from each other.	The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the upper right image.



#### '284 Patent Claim

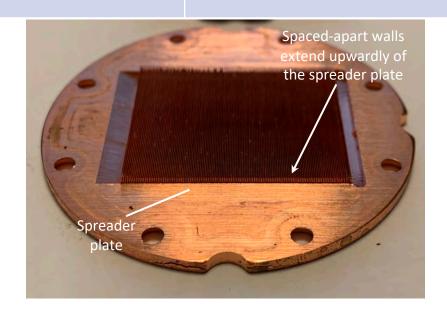
4. A fluid heat exchanger according to claim 1, further comprising a spreader plate, wherein the plurality of spaced-apart walls extends upwardly of the spreader plate, wherein the housing contacts the spreader plate.

#### **Comparison to ROG Device**

The image below shows the plurality of spacedapart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.

The image to the right shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing (e.g., the stud).

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)



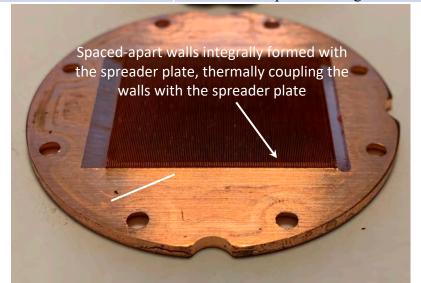


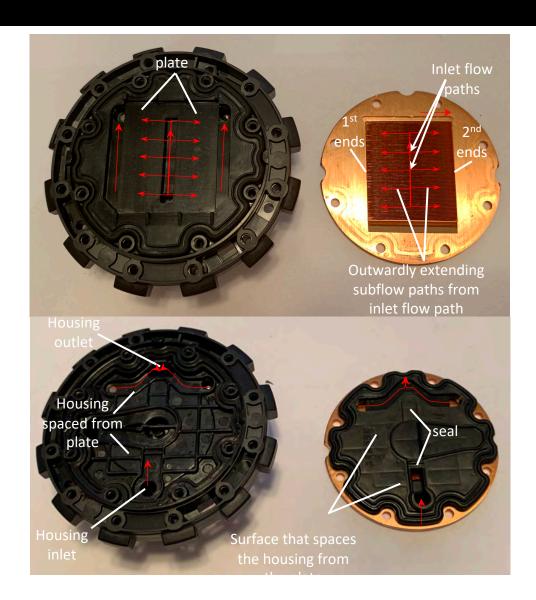
#### '284 Patent Claim

# 5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spacedapart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

#### **Comparison to ROG Device**

The image below shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall. The images at lower left and lower right show the outlet flow paths extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate overlying the walls on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.

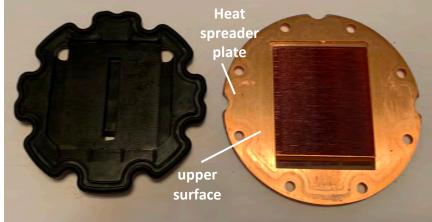


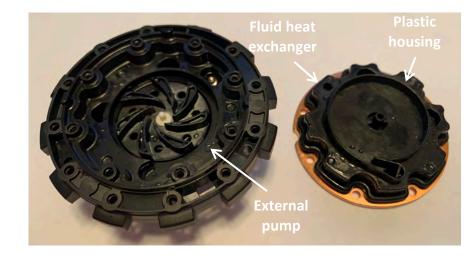


'284 Patent Claim **Comparison to ROG Device** The ROG device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the ROG device has a 15. A fluid heat exchanger copper heat spreader plate and a housing separable for cooling an electronic from the pump. Thus, the ROG device includes "a component that transfers heat from a heat source to device, the heat exchanger comprising: a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).







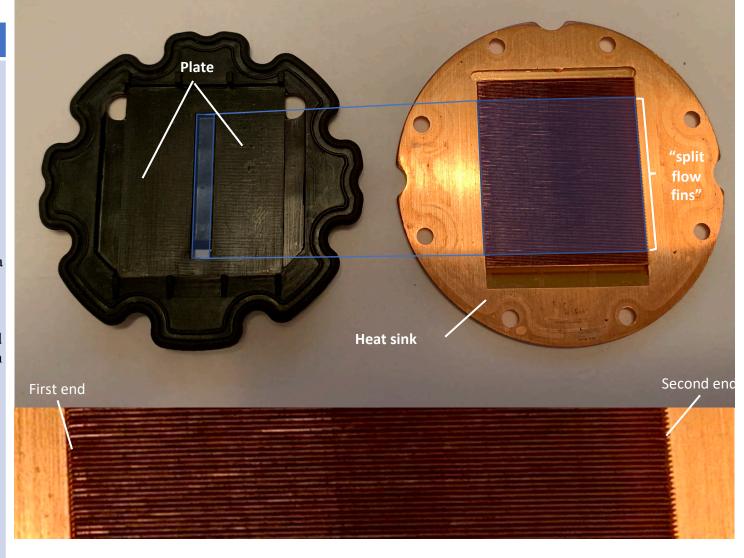


'284 Patent Claim

#### **Comparison to ROG Device**

The ROG device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them, defining channels. For example, the ROG device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



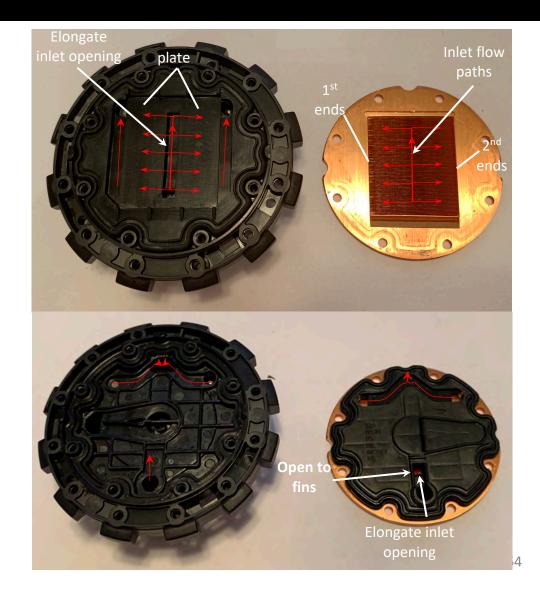
15[a]. a plurality of walls defining a corresponding plurality of microchannels extending from respective first ends to respective second ends;

#### '284 Patent Claim

#### **Comparison to ROG Device**

15[b]. an elongate *inlet opening* to the microchannels and defining an *inlet flow path* to each respective microchannel at a position between the respective first ends and the respective second ends;

The top left image shows the plate defines an elongate inlet that opens to the microchannels and that defines an inlet flow path to each microchannel. The elongate inlet is oriented transversely to the walls. The red central arrwos at top left and top right show that the elongate inlet is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed.



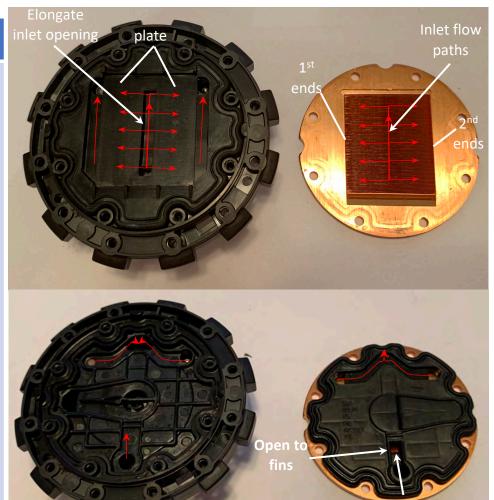
#### '284 Patent Claim

15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow *path* and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective inlet flow path and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end:

#### **Comparison to ROG Device**

The image at top left shows the claimed plate and the image at bottom right shows the claimed plate when it is positioned over the plurality of walls, closing off the plurality of microchannels. On disassembly, the plate had depressions that corresponded to the fin edges. (See detail at far right.)

The upper left image shows the inlet flow paths, as well as the outlet flow paths positioned outward of the plate, extending from the microchannel first ends and from the microchannel second ends. The plate overlies the walls and closes off the plurality of microchannels between the inlet flow paths (central red arrow) and the outlet flow paths (laterally outward red arrows).



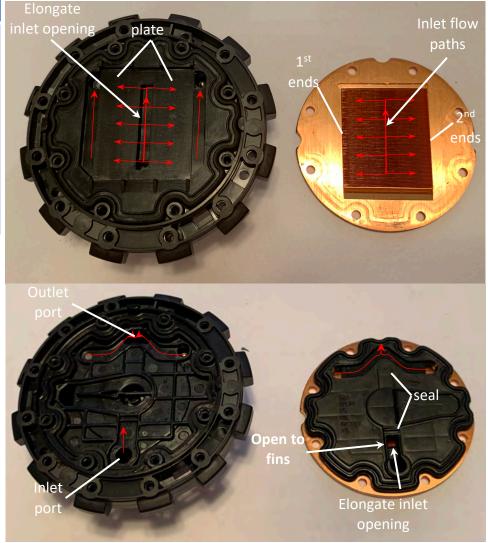


15[d]. a housing positioned over and spaced apart from the plate, wherein the housing has an inlet port and an outlet port spaced apart from each other; and

'284 Patent Claim

#### **Comparison to ROG Device**

The upper left image shows the plate and seal engaged with the housing. The lower left image shows the housing and the lower right image shows the plate overtop the walls of the heat spreader. As indicated by the curved red arrows at lower right, the housing is spaced from the plate, defining a gap through which coolant can flow from the ends of the microchannels to the outlet port (lower left). Accordingly, the housing is spaced from the plate. Note also the ribs at lower left ensure the gap exists between the plate.



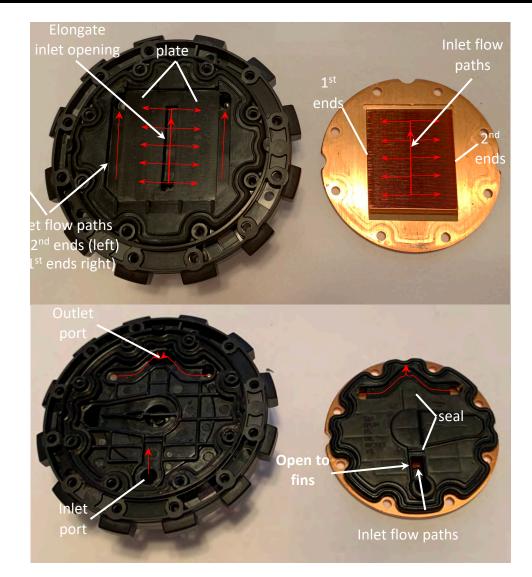
#### '284 Patent Claim

15[e]. a *seal* extending between the housing and the plate and separating the *inlet flow path* to each respective microchannel from both corresponding outlet flow paths from the respective microchannel, wherein each respective inlet each respective *flow path* splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow paths extends outwardly toward the corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding microchannel second end, wherein the subflow path toward the microchannel first end passes from the respective first end along the corresponding outlet flow path e,

#### **Comparison to ROG Device**

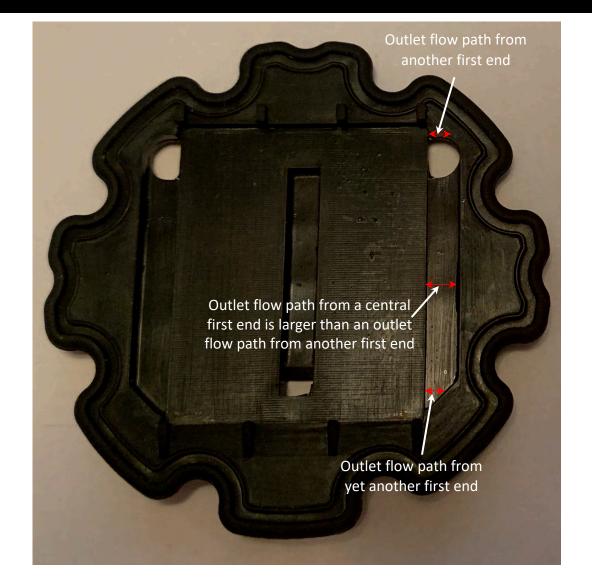
The lower right image shows the claimed seal that

extends between the plate and the housing, separating the inlet flow paths from the outlet flow paths. The upper left image shows the seal engaged with the housing and the lower right image shows the seal and plate overlying the walls. The upper right image shows the inlet flow paths and the other images show the outlet flow paths. As shown at lower right, the seal separates the inlet flow paths (upper right) from the outlet flow paths (lower right). The upper right image shows that each inlet flow path splits into two subflow paths after entering the corresponding microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The upper left image shows that the subflow of coolant directed toward the first end exits from the microchannel along that microchannel's first outlet flow path, and that the subflow of coolant directed toward the second end exits from the microchannel along that microchannel's second outlet flow path.



# 284 Patent Claim Comparison to ROG Device 15[e][1]. wherein the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end spaced apart from the centrally located first end. The image at right shows that the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end that is spaced apart

from the central first end.



#### '284 Patent Claim

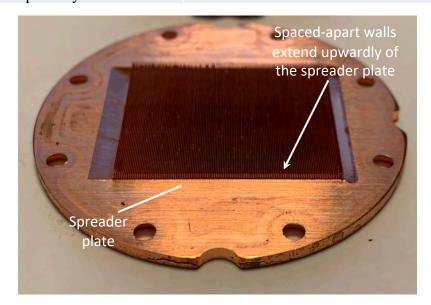
19. A fluid heat exchanger according to claim 15, further comprising a spreader plate, wherein the plurality of walls extends upwardly of the spreader plate and the housing contacts the spreader plate.

20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls.

#### **Comparison to ROG Device**

The image below shows the heat spreader plate has walls extending upwardly from the heat spreader plate. As shown at right, the housing has a side wall that extends downwardly over the walls and contacts the spreader plate.

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.) The heat spreader plate and walls are integrally formed, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.





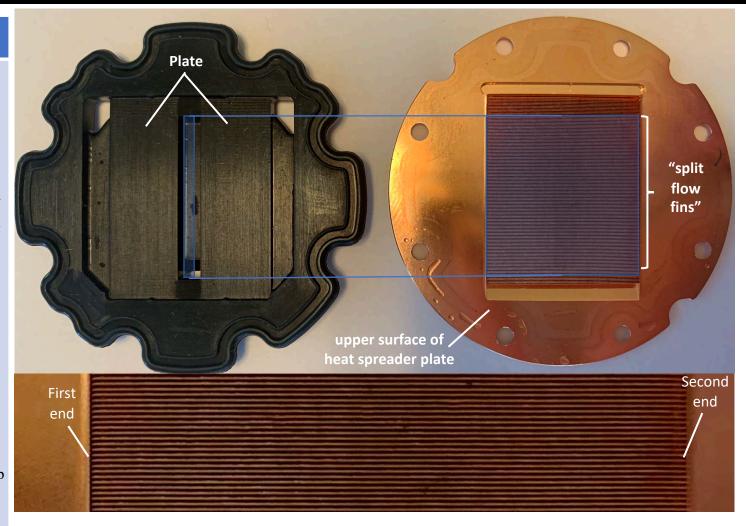
# Exhibit B-4

Asetek Gen 7 (represented by an NZXT X53 device)

'284 Patent Claim **Comparison to NZXT X53** The X53 device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the X53 device has a 1. A fluid heat exchanger for copper heat spreader plate and a housing separable cooling an electronic device, from the pump. Thus, the X53 device includes "a component that transfers heat from a heat source to the heat exchanger comprising: a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).



'284 Patent Claim **Comparison to NZXT X53** The X53 device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them. For example, the X53 device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls 1[a]. a plurality of spaceddefine a plurality of microchannels that apart walls defining a correspond to the spaced-apart walls. As each corresponding plurality of microchannel extends from a first end to a microchannels having second end, each in the plurality of respective first ends and microchannels has a respective first end and second ends; second end, as shown in the bottom photograph (detail view of upper right photograph). As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



'284 Patent Claim	Comparison to NZXT X53
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	FIG. 5 shows the claimed plate that is positioned over the plurality of walls (e.g., when oriented as in FIG. 1), closing off the plurality of microchannels.

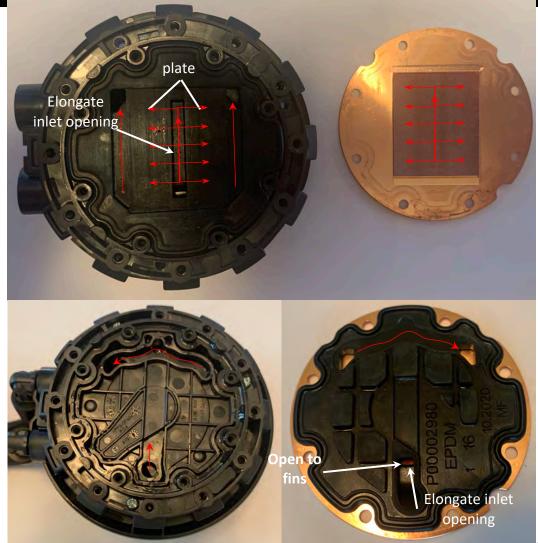


### '284 Patent Claim

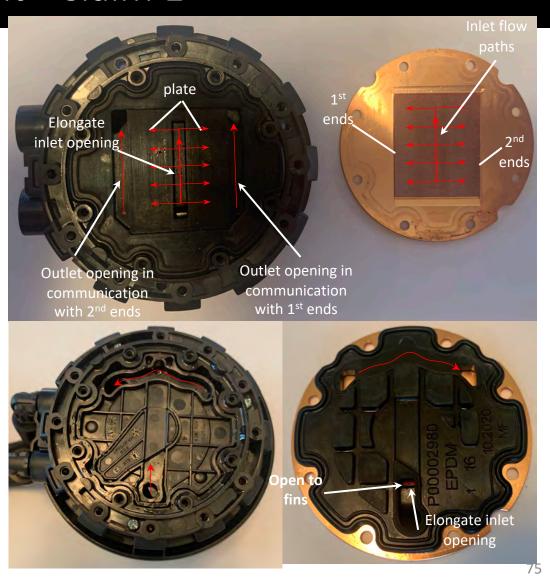
### Comparison to NZXT X53

1[c]. an elongate *inlet opening* in fluid communication with each of the microchannels, wherein *an inlet flow path* to each respective microchannel is positioned between the respective first ends and second ends;

The upper left image shows the plate defines an elongate inlet opening oriented transversely to the walls and in fluid communication with each of the microchannels. The upper right image also shows that the elongate inlet opening is in fluid communication with each of the plurality of micro channels at a position between the first ends of the microchannels and the second ends of the microchannels, defining an inlet flow path (indicated by central red arrow) to each microchannel, as claimed, between the first ends and the second ends of the microchannels.



'284 Patent Claim	Comparison to NZXT X53
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown at upper left.  When the plate is positioned over the fins (e.g., lower right), the indicated fluid outlet openings are positioned at each of the microchannel first ends, and the opposite outlet openings are positioned at each of the microchannel second ends.  Each fluid outlet opening is defined by the edge of the plate, as shown in FIG. 5. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)

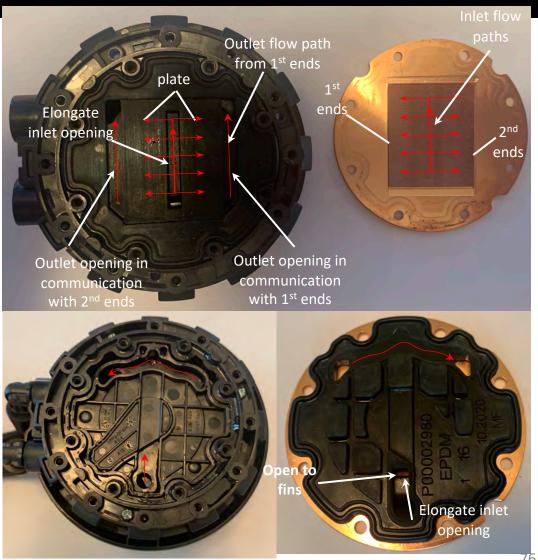


### '284 Patent Claim

1[d][1]. wherein acorresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the *inlet flow path* to the respective microchannel,

### **Comparison to NZXT X53**

Fluid exiting each microchannel first end (upper left, upper right) follows an outlet flow path (indicated by red arrows at upper left) positioned laterally outward of the plate relative to the inlet flow path (central red arrow) that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red arrow.



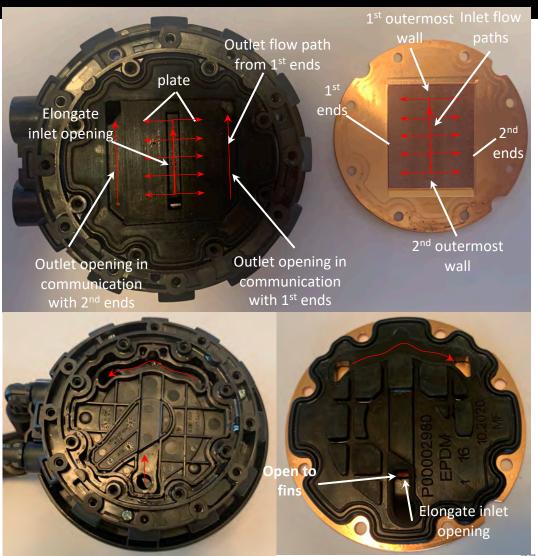
### '284 Patent Claim

1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost wall relative to the plurality of microchannels,

### **Comparison to NZXT X53**

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image.

The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

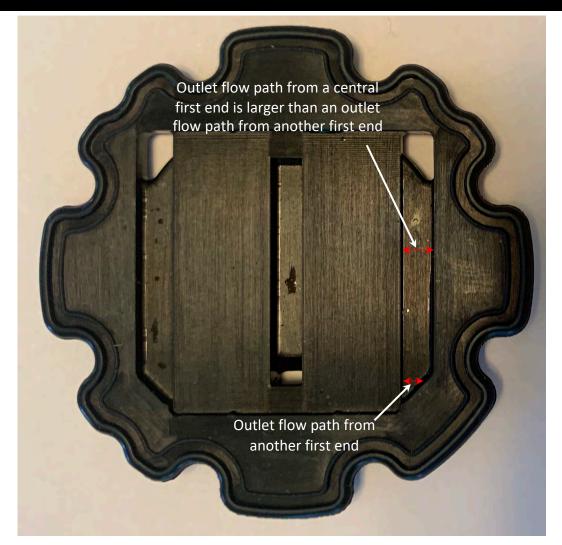


### '284 Patent Claim

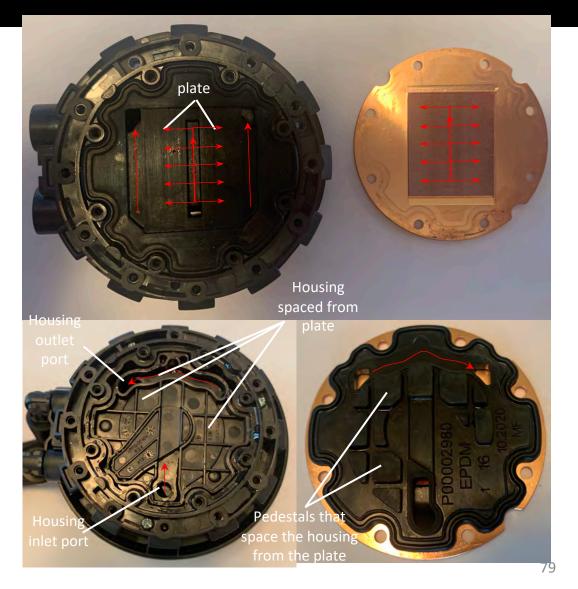
1[d][3]. wherein *the outlet flow path* from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than *the outlet flow path* from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

### **Comparison to NZXT X53**

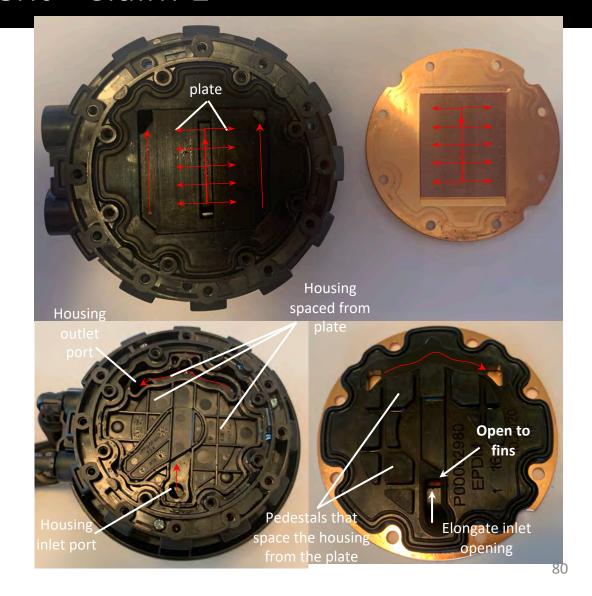
The image to the right shows a close-up view of the plate and additional structure, including an outlet flow path from the first end of a centrally positioned microchannel and from another microchannel positioned adjacent the first outermost wall. As shown, the outlet flow path from the central microchannel is larger than the outlet flow path from another microchannel.



'284 Patent Claim	Comparison to NZXT X53
1[e]. a housing positioned over and spaced apart from the plate,	When the plate is assembled with the housing (top, left), portions of the housing are spaced from the plate (indicated bottom left). For example, the housing defines a web of ribs with intermediate recesses. For example, the housing defines a web of ribs with intermediate recesses. Pedestals straddle the ribs and rest in the recessed regions of the housing, providing space between the plate and the housing. Further, other recesses in the housing define passages through which the coolant flows, and thus must be spaced from the plate.  See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).



'284 Patent Claim **Comparison to NZXT X53** The housing has an inlet port and an outlet port spaced apart from each other as shown at lower left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the upper right image. (See also lower right image direct fluid connection between inlet port and elongate inlet opening). For example, the central red arrow indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives 1[e][1]. wherein the coolant that passed through the indicated inlet port, housing has an inlet port and thus the inlet port is in fluid communication and an outlet port spaced with the path of each flow entering into the apart from each other, microchannels. wherein the inlet port is in fluid communication with each respective *inlet* Similarly, the outlet port (indicated bottom left) receives coolant that exhausts from each *flow path* and the outlet microchannel, and thus is in fluid communication port is in fluid communication with each with each outlet flow path from the microchannel first ends. The straight red arrows at upper left and respective outlet flow *path* from the the curved red arrows at bottom right indicate a flow of coolant after exhausting from the microchannel first ends; microchannel first ends. and



### '284 Patent Claim

### 1[f]. *a seal* extending between the housing and the plate and separating the outlet flow path from each of the microchannel

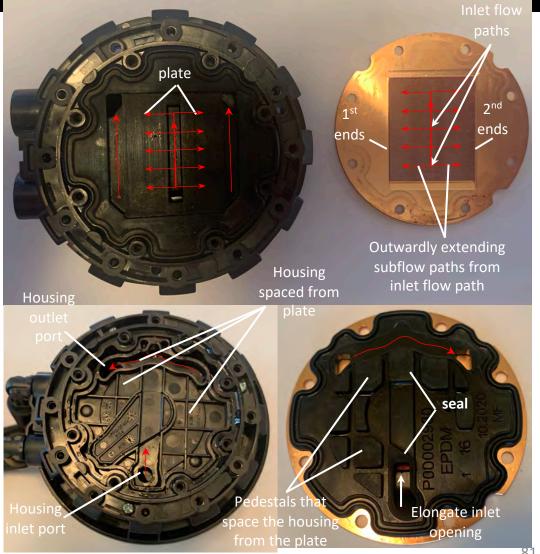
first ends,

1[f][1]. wherein each respective inlet flow *path* is split generally into two subflow paths, wherein one of the subflow paths extends outwardly toward the corresponding microchannel first end and passes outwardly of the plate along the outlet *flow path* from the respective microchannel first end.

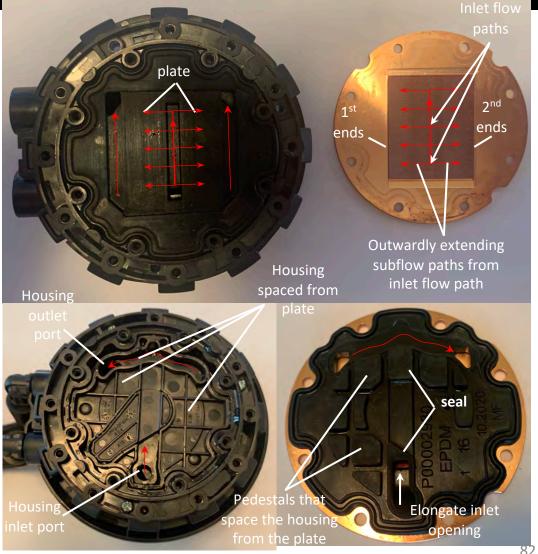
### **Comparison to NZXT X53**

The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to the inlet flow path to each prevent leakage through the gap. The image at upper of the microchannels from left shows the seal engaged with the housing and the image at upper right shows the inlet flow paths and both bottom images show the outlet flow paths. The seal (lower right) separates the inlet flow paths from the outlet flow paths.

> The upper right image shows each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.



### '284 Patent Claim **Comparison to NZXT X53** The upper right image shows each flow of coolant 3. A fluid heat exchanger entering a microchannel bifurcates (splits) into two according to claim 1, subflows as described above. Within each wherein the two subflow microchannel, the subflow paths are directed paths are directed away from outwardly away from each other, as indicated in the each other. upper right image.



### '284 Patent Claim

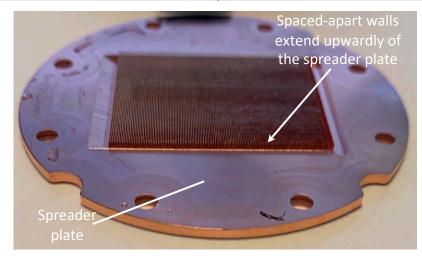
# 4. A fluid heat exchanger according to claim 1, further comprising a spreader plate, wherein the plurality of spaced-apart walls extends upwardly of the spreader plate, wherein the housing contacts the spreader plate.

### **Comparison to NZXT X53**

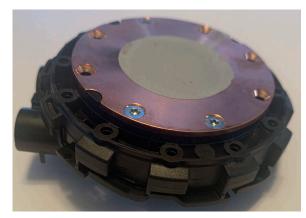
The image below shows the plurality of spacedapart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.

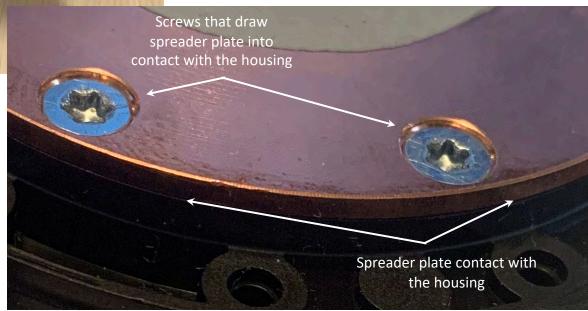
The image to the right shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing.

('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)







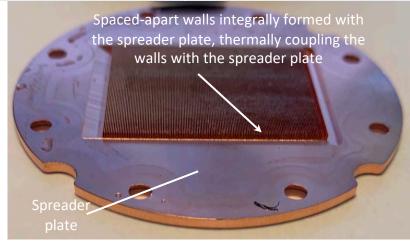


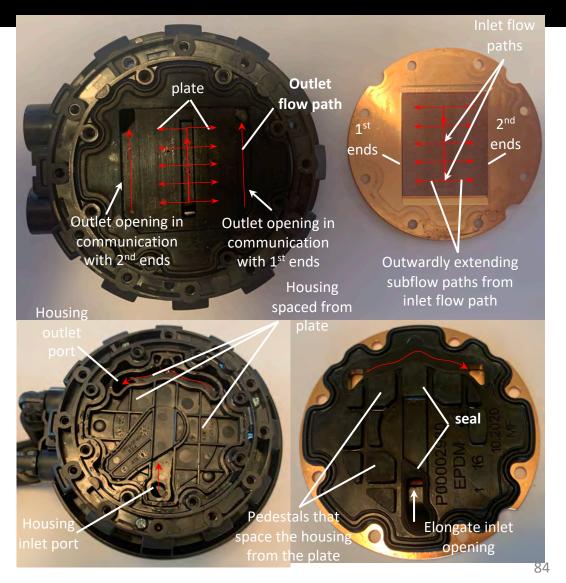
### '284 Patent Claim

5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spaced-apart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

### **Comparison to NZXT X53**

The image below shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall. The images at upper left, lower left and lower right show the outlet flow paths (red arrows) extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate overlying the walls on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.





'284 Patent Claim

### Comparison to NZXT X53

15. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:

The X53 device includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the X53 device has a copper heat spreader plate and a housing separable from the pump. Thus, the X53 device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component." As shown to the right, the pump is external to the component that transfers heat from a heat source to a cooling liquid. The plastic housing can be sectioned parallel to the copper plate to define a pump external to the component (e.g., below the plane of the section).



'284 Patent Claim

15[a]. a plurality of walls

defining a corresponding plurality of microchannels

extending from respective

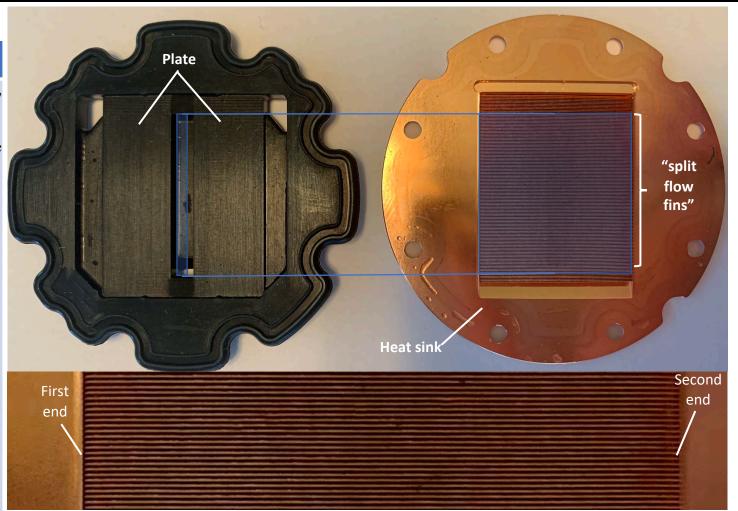
first ends to respective

second ends;

### **Comparison to NZXT X53**

The X53 device literally includes more than one fin, and this group of fins is spaced apart from each other without any intervening solid structure between them, defining channels. For example, the X53 device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom photograph (detail view of upper right photograph).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

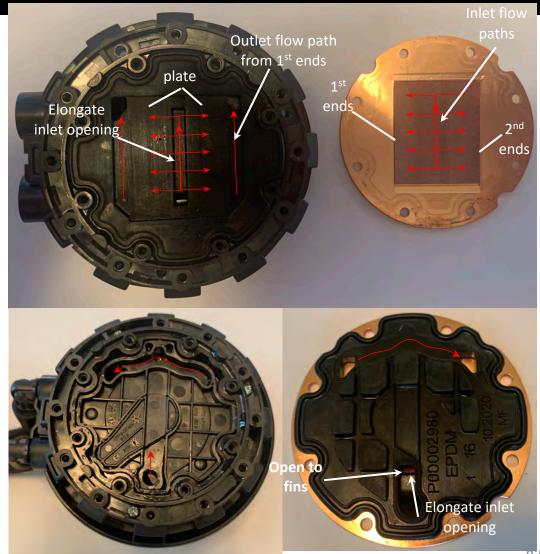


### '284 Patent Claim

15[b]. an elongate *inlet opening* to the microchannels and defining an *inlet flow path* to each respective microchannel at a position between the respective first ends and the respective second ends;

### **Comparison to NZXT X53**

The top left image shows the plate defines an elongate inlet that opens to the microchannels and that defines an inlet flow path to each microchannel. The elongate inlet is oriented transversely to the walls. The red central arrwos at top left and top right show that the elongate inlet is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed.



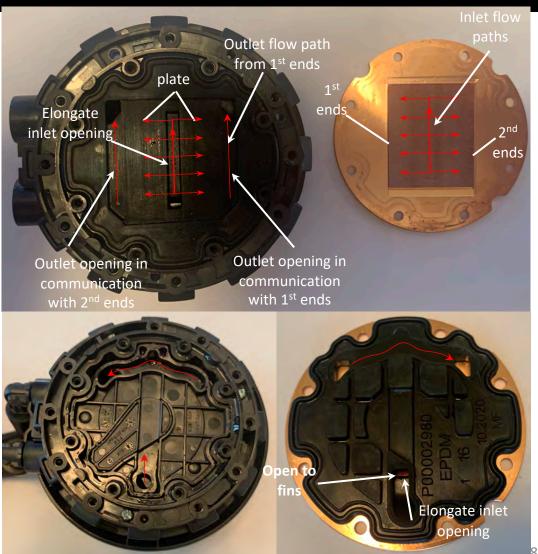
### '284 Patent Claim

15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow path and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective *inlet flow path* and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end;

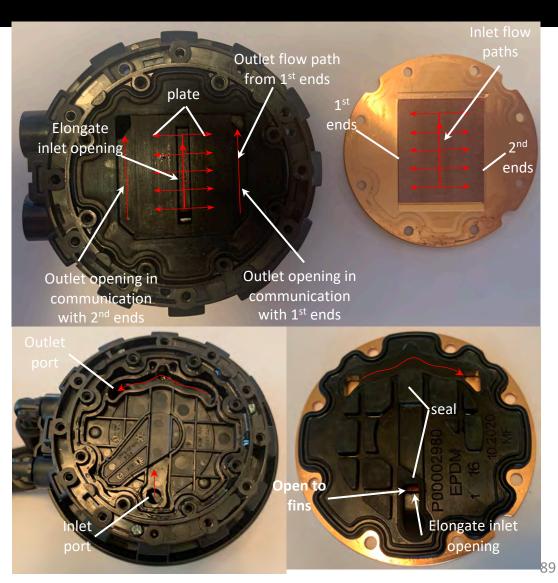
### **Comparison to NZXT X53**

The image at top left shows the claimed plate and the image at bottom right shows the claimed plate when it is positioned over the plurality of walls, closing off the plurality of microchannels.

The upper left image shows the inlet flow paths, as well as the outlet flow paths positioned outward of the plate, extending from the microchannel first ends and from the microchannel second ends. The plate overlies the walls and closes off the plurality of microchannels between the inlet flow paths (central red arrow) and the outlet flow paths (laterally outward red arrows).



'284 Patent Claim **Comparison to NZXT X53** The upper left image shows the plate and seal engaged with the housing. The lower left image shows the housing and the lower right image shows the plate overtop the walls of the heat 15[d]. a housing positioned over and spaced apart from the spreader. As indicated by the curved red arrow at plate, wherein the housing has lower right, the housing is spaced from the plate, an inlet port and an outlet port defining a gap through which coolant can flow from the ends of the microchannels to the outlet spaced apart from each other; and port (lower left). Accordingly, the housing is spaced from the plate. Note also the ribs at lower left ensure the gap exists between the housing and the plate.

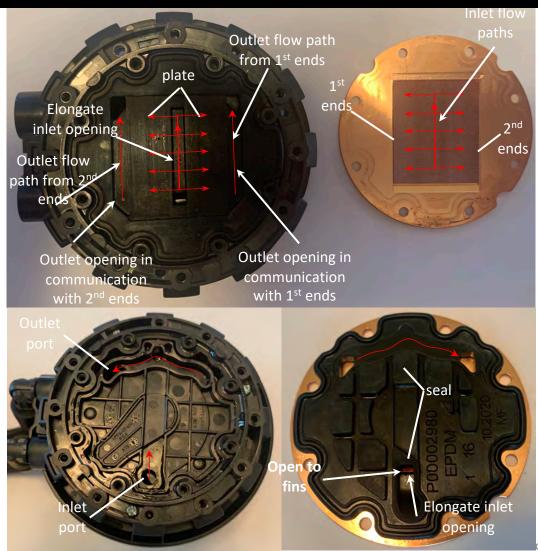


### '284 Patent Claim

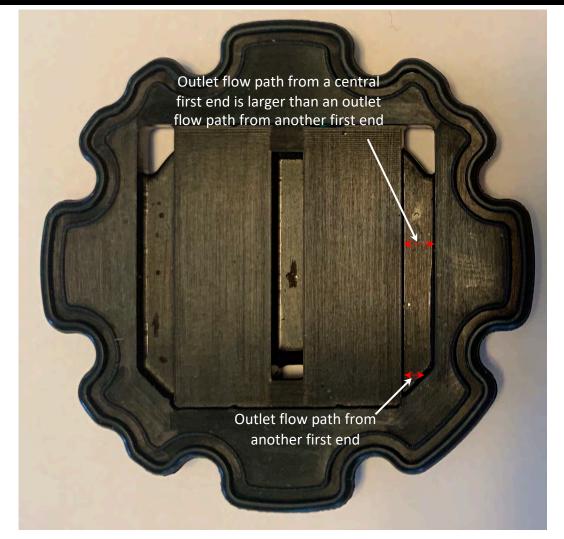
### **Comparison to NZXT X53**

15[e]. a *seal* extending between the housing and the plate and separating the The lower right image shows the claimed seal that inlet flow path to each respective microchannel from both corresponding outlet flow paths from the respective inlet each respective flow path splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow paths extends outwardly first end and the other of the two subflow paths extends outwardly second end, wherein the subflow path toward the microchannel first end passes from the respective first end along the corresponding outlet flow path e, wherein the outlet flow path from a centrally located first end is larger than the outlet flow path from a located first end.

extends between the plate and the housing, separating the inlet flow paths from the outlet flow paths. The upper left image shows the seal engaged microchannel, wherein each respective with the housing and the lower right image shows the seal and plate overlying the walls. The upper right image shows the inlet flow paths and the other images show the outlet flow paths. As shown at lower right, the seal separates the inlet flow paths (upper right) from the outlet flow paths (lower toward the corresponding microchannel right). The upper right image shows that each inlet flow path splits into two subflow paths after entering the corresponding microchannel and that toward the corresponding microchannel one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The upper left image shows that the subflow of coolant directed toward the first end exits from the microchannel along that microchannel's first outlet flow path (vertical red arrow), and that the subflow of coolant directed first end spaced apart from the centrally toward the second end exits from the microchannel along that microchannel's second outlet flow path (vertical red arrow).



'284 Patent Claim	Comparison to NZXT X53
15[e][1]. wherein t <i>he outlet</i>	
<i>flow path</i> from a centrally	
located first end is larger	The image at right shows that the outlet flow path
than the <i>outlet flow path</i>	from a centrally located first end is larger than the
from a first end spaced apart	outlet flow path from a first end that is spaced apart
from the centrally located	from the central first end.
first end.	
first end.	



### '284 Patent Claim

19. A fluid heat exchanger according to claim 15, further comprising a spreader plate, wherein the plurality of walls extends upwardly of the spreader plate and the housing contacts the spreader plate.

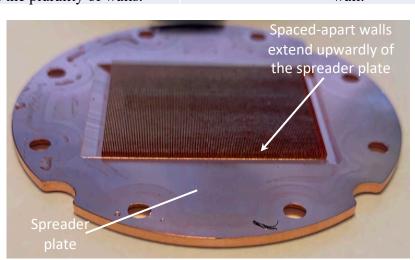
20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls.

### **Comparison to NZXT X53**

The image below shows the heat spreader plate has walls extending upwardly from the heat spreader plate. As shown at right, the housing has a side wall that extends downwardly over the walls and contacts the spreader plate.

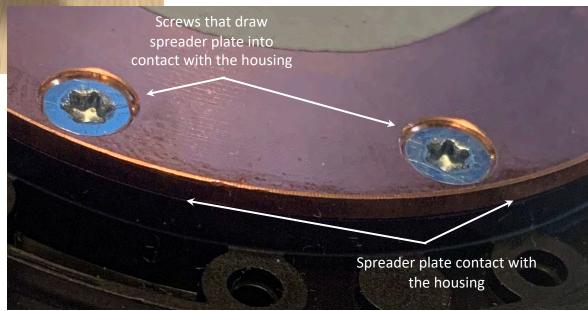
('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)

The heat spreader plate and walls are integrally formed, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.





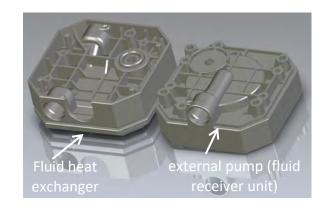




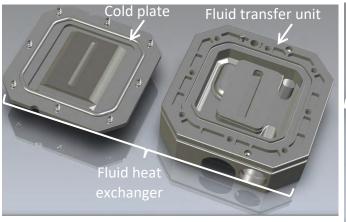
# Exhibit B-5

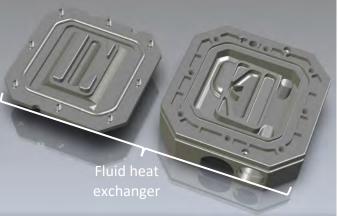
CoolIT's New Design (represented by CAD files)

'284 Patent Claim	Comparison to New Design
1. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:	The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the New Design device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."







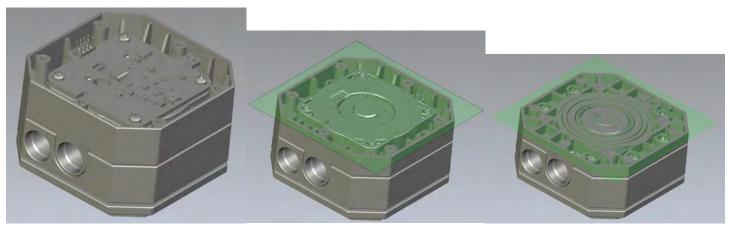


284 Patent Claim	Comparison to New Design
1. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:	The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable
	1
	pump. Thus, the New Design device includes "a
	component that transfers heat from a heat source to
	a cooling liquid circulated by a pump that is
	external to the component."

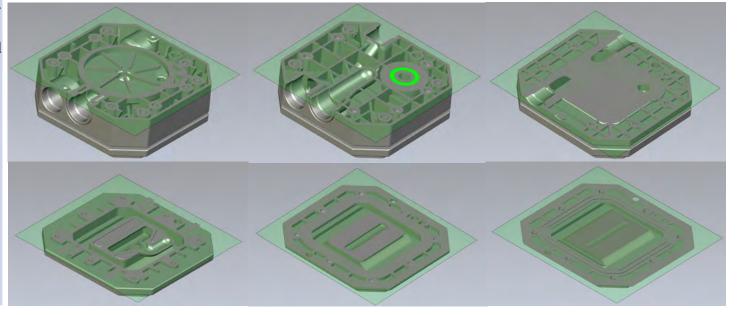
Comparison to New Design

2284 Patent Claim

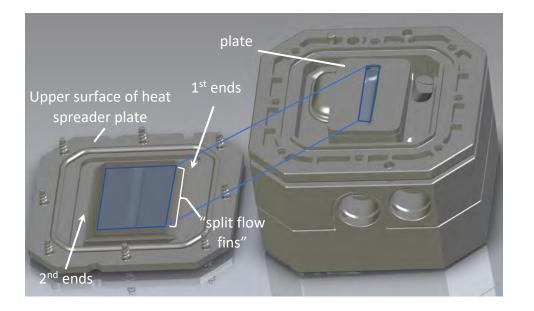




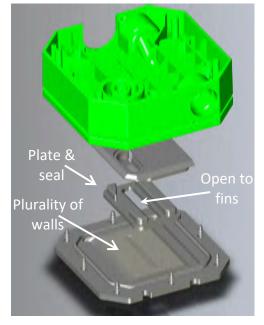
'284 Patent Claim	Comparison to New Design
1. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:	The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the New Design device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."

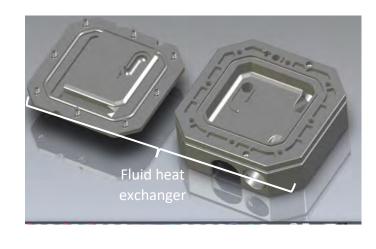


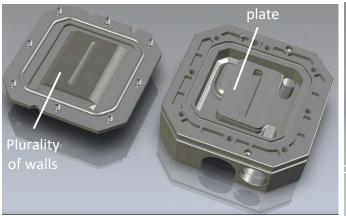
'284 Patent Claim	Comparison to New Design
1[a]. a plurality of spaced- apart walls defining a corresponding plurality of microchannels having respective first ends and second ends;	The New Design literally includes more than on spaced-apart wall and thus satisfies the plurality limitation. For example, the New Design has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structur between it and the next fin; right, shaded blue). The spacing between each pair of walls defines microchannel (e.g., they define a "channel with width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown at right.  As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

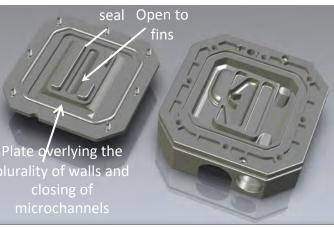


'284 Patent Claim	Comparison to New Design
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The lower right image shows the plate positioned over the plurality of walls and partially closing off the microchannels.









### '284 Patent Claim

an inlet flow path to each

respective microchannel is

positioned between the respective first ends and

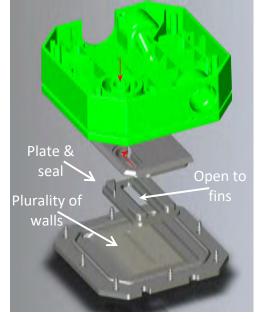
opening in fluid

second ends;

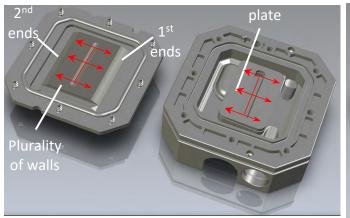
## **Comparison to New Design**

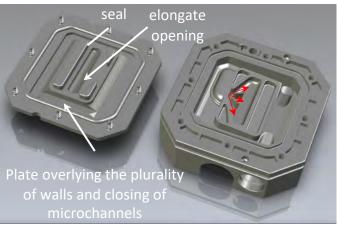
The upper left image shows the plate defines an elongate inlet opening oriented transversely to the walls and in fluid communication with each 1[c]. an elongate *inlet* of the microchannels. The lower right image shows the plate positioned over the walls. communication with each of the microchannels, wherein

The lower left image also shows that the elongate inlet opening is in fluid communication with each of the plurality of micro channels at a position between the first ends of the microchannels and the second ends of the microchannels, defining an inlet flow path (indicated by central red arrow) to each microchannel, as claimed, between the first ends and the second ends of the microchannels.

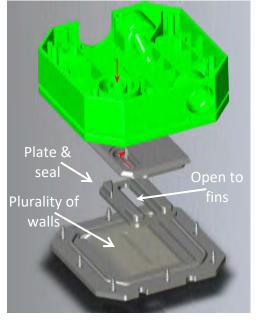




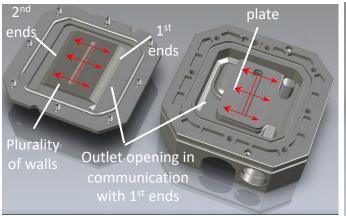


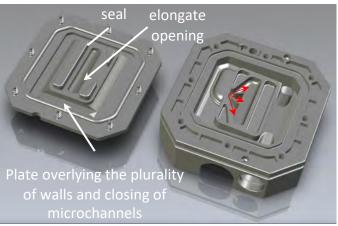


'284 Patent Claim	Comparison to New Design
	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown at lower left.
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	When the plate is positioned over the fins (e.g., lower right), the indicated fluid outlet openings are positioned at each of the microchannel first ends, and the opposite outlet openings are positioned at each of the microchannel second ends.
	Each fluid outlet opening is defined by the edge of the plate, as shown in FIG. 5. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)







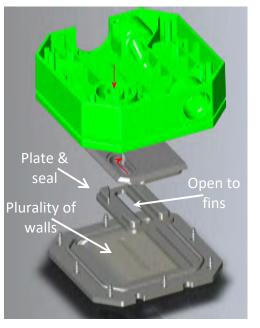


### '284 Patent Claim

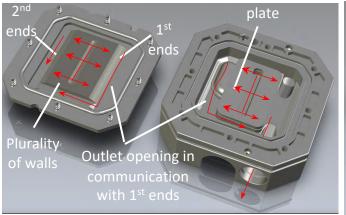
1[d][1]. wherein a corresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the inlet flow path to the respective microchannel,

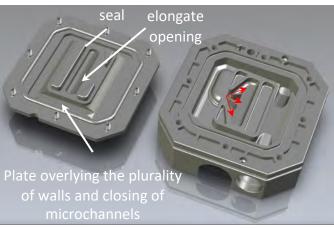
### **Comparison to New Design**

Fluid exiting each microchannel first end (lower left) follows an outlet flow path (indicated by bent red arrow at lower left) positioned laterally outward of the plate relative to the inlet flow path (central red line over fins) that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red line.









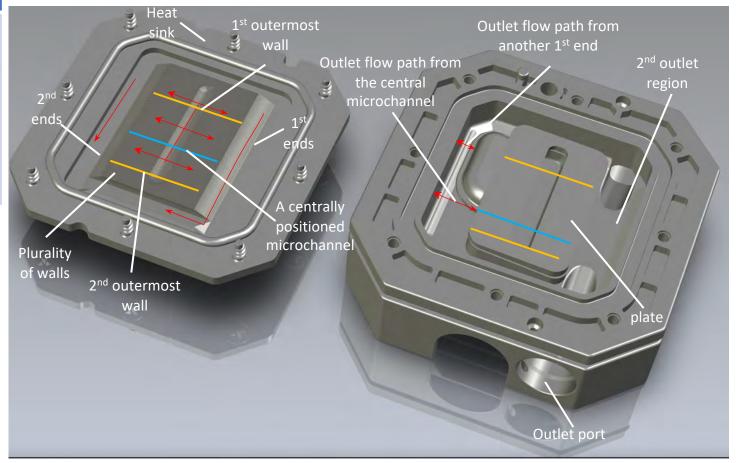
### '284 Patent Claim

1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost wall relative to the plurality of microchannels,

### **Comparison to New Design**

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image.

The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

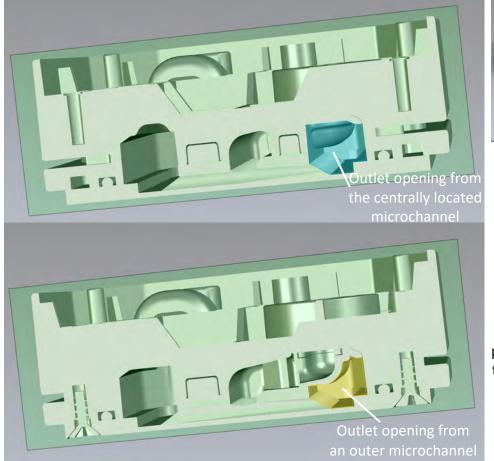


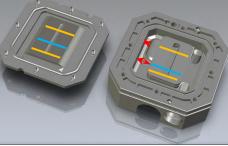
### '284 Patent Claim

### **Comparison to New Design**

1[d][3]. wherein the outlet flow path from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

The top left image and the bottom left image are cross-sectional views of the New Design taken parallel the identified centrally positioned microchannel and a microchannel adjacent an outermost wall ("outer microchannel") identified on the previous page. The blue shaded area in the top left image shows the outlet opening from the centrally located microchannel. The orange shaded area in the bottom left image shows the outlet opening from the "outer microchannel." At right, a comparison of the areas of the outlet openings is shown. In the middle right image, the areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the centrally positioned microchannel that remains when the area of the opening from the outer microchannel is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally positioned microchannel is larger than the outlet opening from at least one of the outer microchannels. Accordingly, the outlet flow path from the central microchannel is larger than the outlet flow path from the "outer micrcochannel."





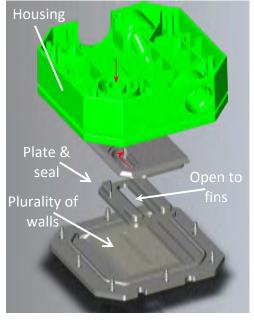
Comparison of outlet openings from the centrally positioned microchannel and the "outer microchannel"

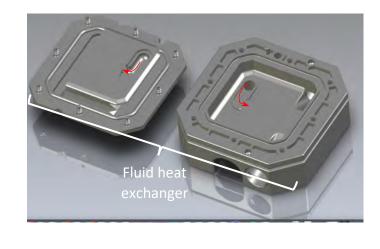


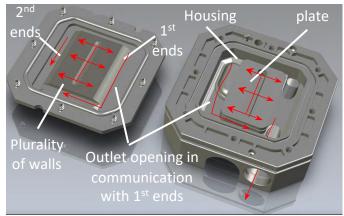
The area by which the outlet opening from the centrally positioned microchannel is larger than the outlet opening from the "outer microchannel"

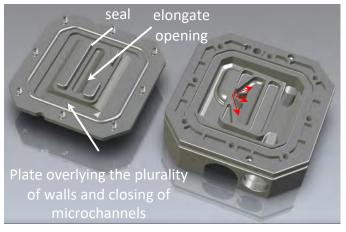


'284 Patent Claim	Comparison to New Design
1[e]. a housing positioned over and spaced apart from the plate,	When the plate is assembled with the housing (top left and bottom left), portions of the housing are spaced from the plate (indicated bottom left). For example, the housing defines several intermediate recesses through which coolant flows. The plate and seal member occupies portions of the recesses, leaving other portions open to provide passages through which the coolant flows between the plate and the housing. Thus, the housing must be spaced from the plate.  See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).







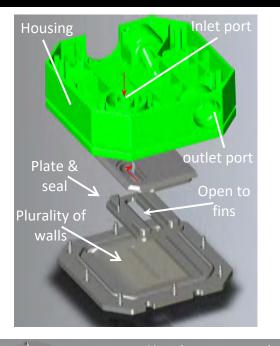


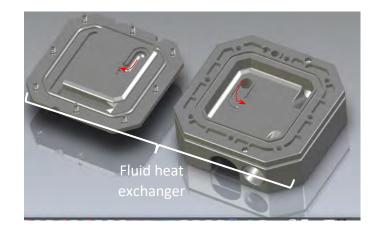
### '284 Patent Claim

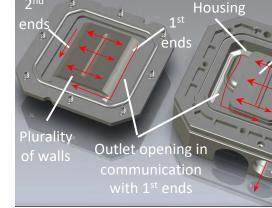
### **Comparison to New Design**

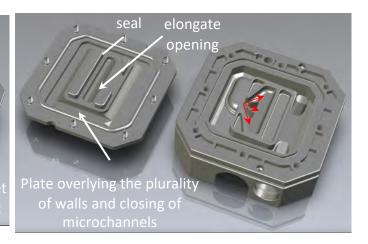
The housing has an inlet port and an outlet port spaced apart from each other as shown at upper left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the lower left right image. (See also red arrows that depict flow of coolant through the device along the inlet passage and into the microchannels (indicated by outward arrows at lower left image)). For example, the central red line overtop the microchannels indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives coolant that passed through the indicated inlet port, and thus the inlet port is in fluid communication with the path of each flow entering into the microchannels.

Similarly, the outlet port (indicated top left and with each respective inlet bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid communication with each outlet flow path from the communication with each microchannel first ends. The red arrows at lower left that are outward of the fins and microchannels indicate a flow of coolant after exhausting from the microchannel first ends as it flows toward the outlet port









1[e][1]. wherein the housing has an inlet port and an outlet port spaced apart from each other, wherein the inlet port is in fluid communication *flow path* and the outlet port is in fluid respective outlet flow *path* from the microchannel first ends:

and

### '284 Patent Claim

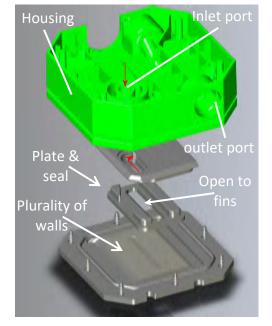
### **Comparison to New Design**

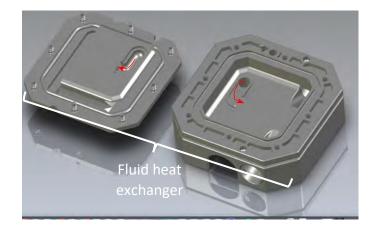
1[f]. *a seal* extending between the housing and the plate and separating *the inlet flow path* to each of the microchannels from the *outlet flow path* from each of the microchannel first ends,

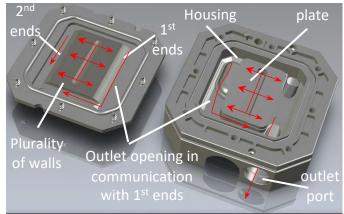
The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap. The image at lower left shows the seal engaged with the housing and separating the inlet flow paths from the outlet flow paths.

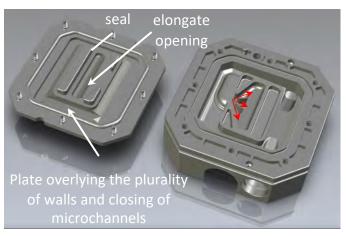
respective *inlet flow*path is split generally into two subflow paths, wherein one of the subflow paths extends outwardly toward the corresponding microchannel first end and passes outwardly of the plate along the outlet flow path from the respective microchannel first end.

The lower left image shows each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.

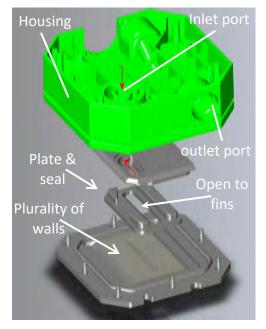




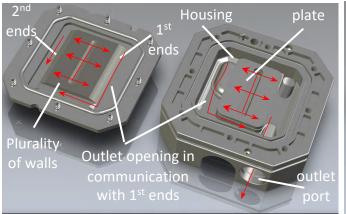


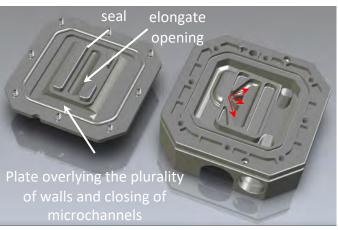


# 3. A fluid heat exchanger according to claim 1, wherein the two subflow paths are directed away from each other. The lower left image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the lower left image (outward red arrows).

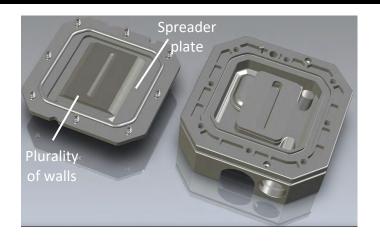


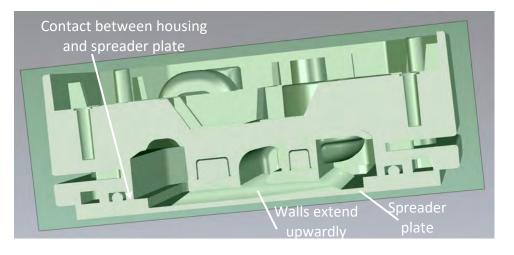






'284 Patent Claim **Comparison to New Design** As shown at top right, the heat exchanger includes a spreader plate. The image at bottom right shows a cross-sectional view of the fluid heat exchanger in a plane parallel 4. A fluid heat exchanger to the plurality of spaced apart walls. As that image according to claim 1, further shows, the plurality of spaced-apart walls comprising a spreader plate, (whichever interpretation of "plurality" is selected) wherein the plurality of extend upwardly of the spreader plate. That image spaced-apart walls extends also shows that the housing contacts the spreader upwardly of the spreader plate, e.g., a side wall of the housing extends plate, wherein the housing downwardly over the walls and contacts the contacts the spreader plate. spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing. ('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)



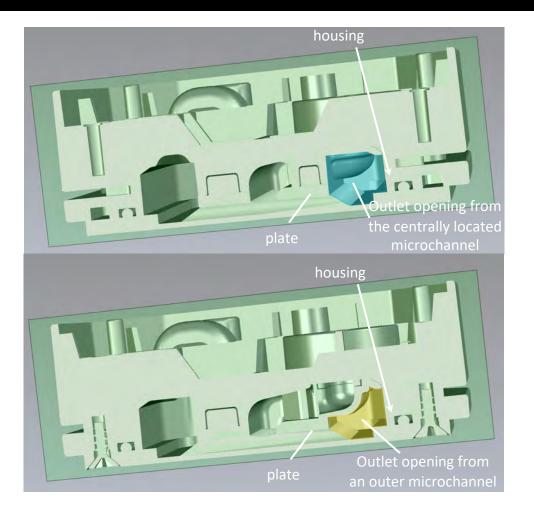


# '284 Patent Claim Comparison to New Design

5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spaced-apart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

The images to the right show the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate is thermally coupled with each of the plate is thermally coupled with each wall.

As well, the images show a portion of one or more outlet flow paths extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate (indicated by blue and orange shading) on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.



'284 Patent Claim

15. A fluid heat exchanger

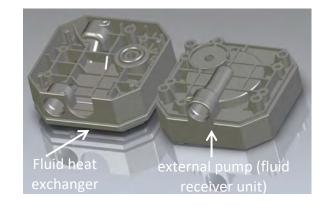
device, the heat exchanger

for cooling an electronic

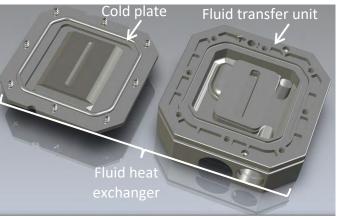
comprising:

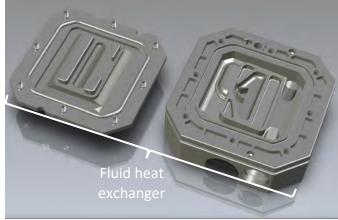
#### **Comparison to New Design**

The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the New Design device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."



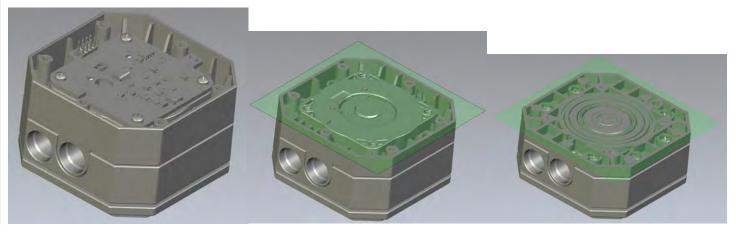




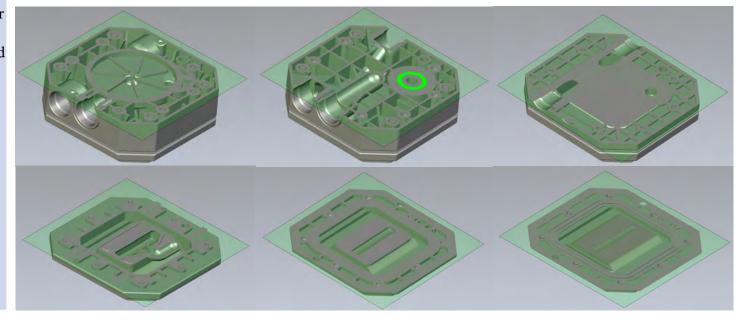


#### '284 Patent Claim **Comparison to New Design** The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 15. A fluid heat exchanger unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid for cooling an electronic transfer unit and cold plate includes a component device, the heat exchanger comprising: that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the New Design device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."





#### '284 Patent Claim **Comparison to New Design** The New Design is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 15. A fluid heat exchanger unit and the cold plate together form a fluid heat exchanger. For example, the assembled fluid for cooling an electronic transfer unit and cold plate includes a component device, the heat exchanger comprising: that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the New Design device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the New Design device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."



15[a]. a plurality of walls defining a corresponding plurality of microchannels extending from respective first ends to respective second ends;

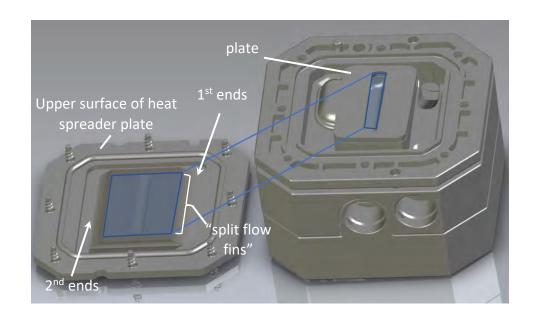
Imitation. Is several space plurality of fibetween it as spacing between microchannel width up to a several space microchannel width up to

'284 Patent Claim

#### **Comparison to New Design**

The New Design literally includes more than one wall and thus satisfies the plurality of walls limitation. For example, the New Design has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom New Design (detail view of upper right New Design).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

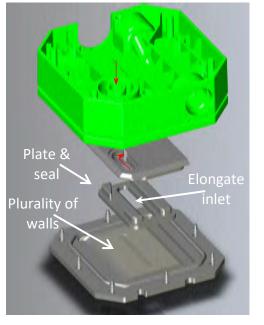


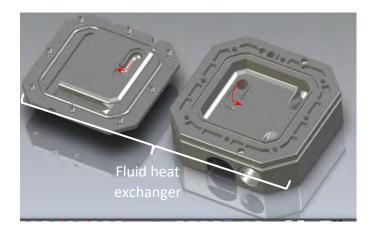
# and that desired and that desired and defining an *inlet flow path* and defining an *inlet flow path* at a position between the respective first ends and the respective second ends; The top left elongate inlet and that desired and that desired microchannels in the bottom in the bottom in the plurality of the channels, channel as

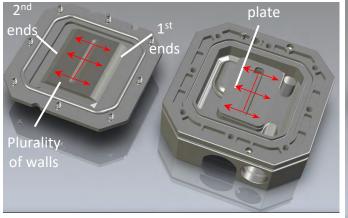
'284 Patent Claim

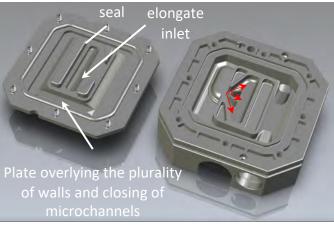
#### **Comparison to New Design**

The top left image shows the plate defines an elongate inlet that opens to the microchannels and that defines an inlet flow path to each microchannel. The elongate inlet is oriented transversely to the walls. The red central arrows in the bottom left image show that the elongate inlet is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed. The lower right image shows the elongate inlet installed over the microchannels.







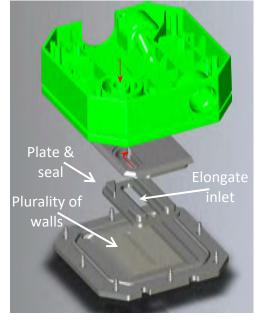


#### '284 Patent Claim Comparison to New Design

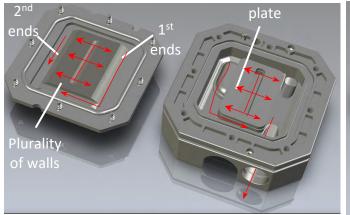
15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow path and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective *inlet flow path* and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end;

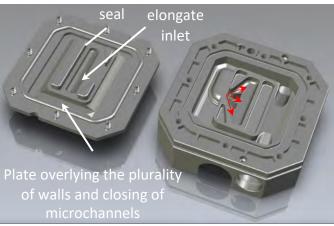
The image at top left shows the claimed plate and the image at bottom right shows the claimed plate when it is positioned over the plurality of walls, closing off the plurality of microchannels.

The lower left image shows the inlet flow paths, as well as the outlet flow paths positioned outward of the plate, extending from the microchannel first ends and from the microchannel second ends. The plate overlies the walls and closes off the plurality of microchannels between the inlet flow paths (central red arrow) and the outlet flow paths (laterally outward red arrows).

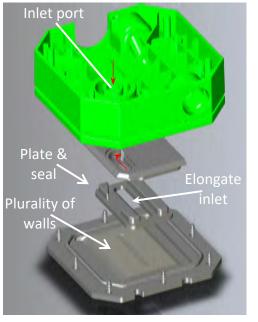




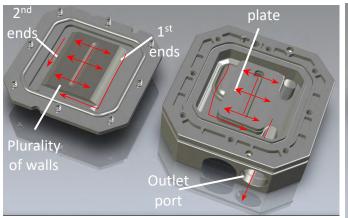


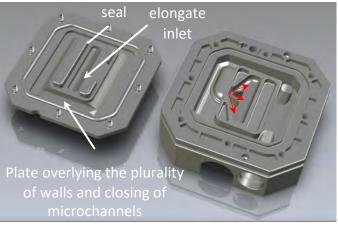


#### '284 Patent Claim **Comparison to New Design** The lower left image shows the plate and seal engaged with the housing. The lower right image shows the housing as well as the plate overtop the walls of the heat spreader. As 15[d]. a housing positioned over and spaced apart from the indicated by the curved red arrow at lower left, the housing is spaced from the plate, defining a plate, wherein the housing has an inlet port and an outlet port gap through which coolant can flow from the ends of the microchannels to the outlet port spaced apart from each other; (lower left). Accordingly, the housing is spaced and from the plate. The upper left image shows the housing's inlet port





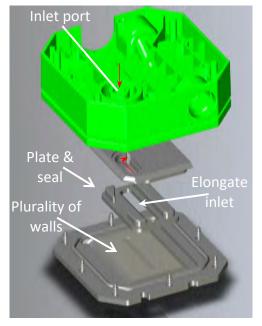




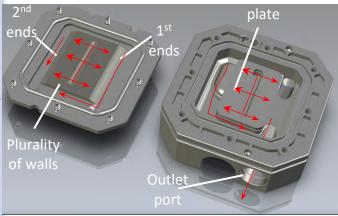
#### '284 Patent Claim **Comparison to New Design**

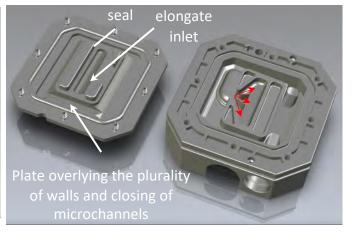
15[e]. a seal extending between the housing and the plate and separating the inlet flow path to each respective microchannel from both corresponding outlet flow *paths* from the respective microchannel, wherein each respective inlet each respective flow path splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding the subflow path toward the the respective first end along the corresponding outlet flow path e, centrally located first end is larger than the *outlet flow path* from a first end spaced apart from the centrally located first end.

The lower right image shows the claimed seal that extends between the plate and the housing, and the lower left shows the seal installed to separate the inlet flow paths from the outlet flow paths (red arrows). As shown at lower left, the seal separates the inlet flow paths from the outlet flow paths. The lower left image shows that each inlet flow path paths extends outwardly toward the splits into two subflow paths after entering the microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The lower microchannel second end, wherein left image also shows that the subflow of coolant directed toward the first end exits from the microchannel first end passes from microchannel along that microchannel's first outlet flow path (L-shaped red arrow), and that the subflow of coolant directed toward the second end exits from wherein the outlet flow path from a the microchannel along that microchannel's second outlet flow path (straight red arrow).









15[e][1]. wherein the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end spaced apart from the centrally located first end.

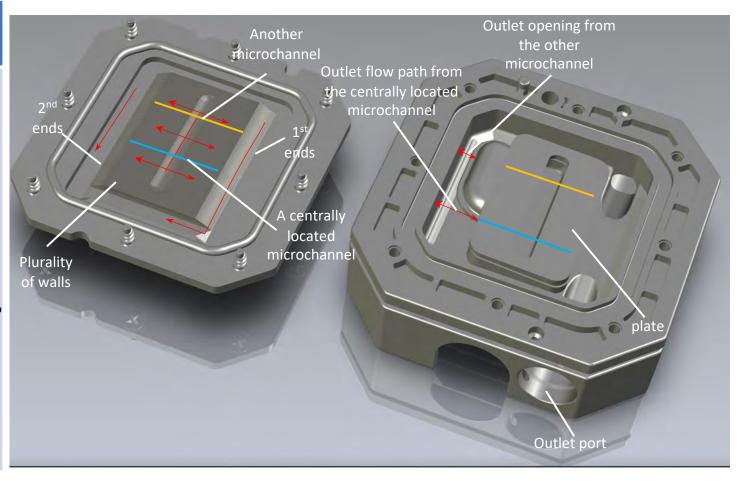
'284 Patent Claim

#### **Comparison to New Design**

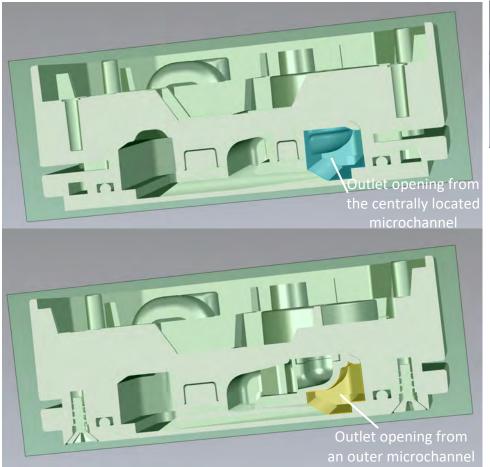
The left image shows that the New Design includes a centrally located microchannel (blue line) and its first end. The left image also shows that the New Design includes a microchannel (orange line) spaced apart from the central microchannel, and this microchannel also has a first end spaced from the first end of the central microchannel. (This is true regardless of whether the microchannels arise from the "split flow fins" or some other selected group of fins.)

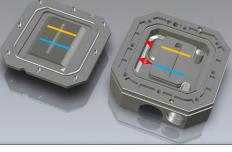
As well, each microchannel has an outlet opening to the first outlet region. As indicated by the red arrows superimposed on the right image, the outlet opening from the identified centrally located microchannel is larger than the outlet opening from the other identified microchannel.

[continued on next page]



'284 Patent Claim **Comparison to New Design** The outlet flow path from the central first end is larger than the outlet flow path from the other first end. The top left image is a cross-sectional view of the New Design taken parallel the identified central microchannel, and the bottom left image is a similar cross-sectional view taken parallel to the other identified microchannel. The blue shaded area at top left shows the outlet opening from the central 15[e][1]. wherein the outlet *flow path* from a centrally first end and the orange shaded area at bottom left located first end is larger shows the outlet opening from the other first end. than the *outlet flow path* from a first end spaced apart A comparison of the areas of the outlet openings is from the centrally located shown at far right. In the middle right image, the first end. areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the central first end that remains when the area of the opening from the other first end is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally first end is larger than the outlet opening from the other first end. Accordingly, the outlet flow path from the central first end is larger than the outlet flow path from the other first end.





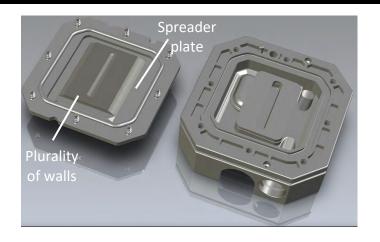
Comparison of outlet openings from the centrally positioned microchannel and the "outer microchannel"

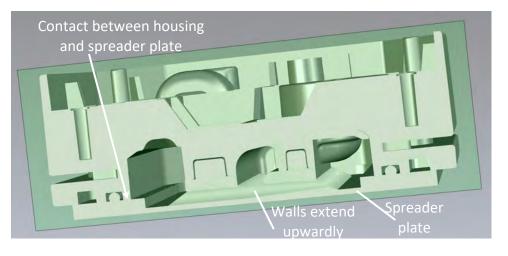


The area by which the outlet opening from the centrally positioned microchannel is larger than the outlet opening from the "outer microchannel"

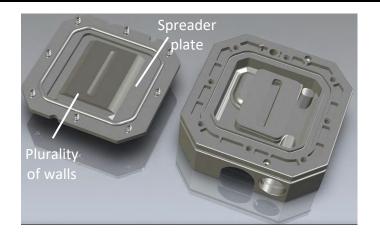


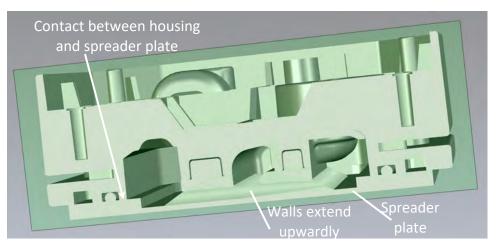
'284 Patent Claim	Comparison to New Design
	As shown at top right, the heat exchanger includes a spreader plate.
19. A fluid heat exchanger according to claim 15, further comprising a spreader (plate, wherein the plurality of walls extends upwardly of the spreader plate and the housing contacts the spreader plate.	The image at bottom right shows a cross-sectional view of the fluid heat exchanger in a plane parallel to the plurality of spaced apart walls. As that image shows, the plurality of spaced-apart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate. That image also shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing.





# 20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls. Comparison to New Design The images to the right show the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.

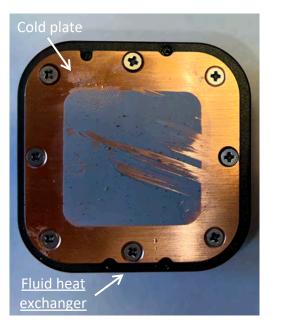


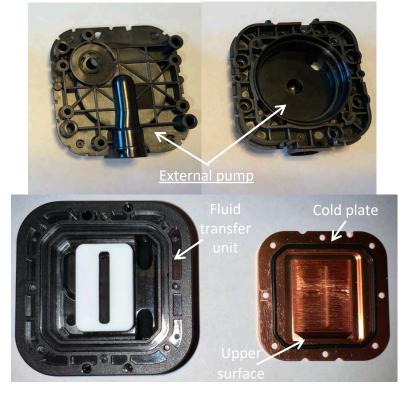


# Exhibit B-6

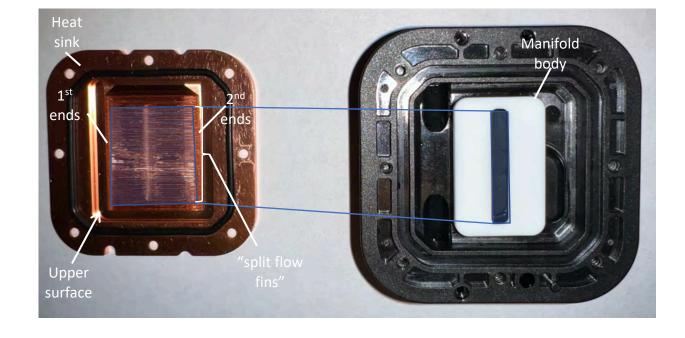
CoolIT's Tamriel Device

'284 Patent Claim	Comparison to Tamriel Device
1. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:	The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."

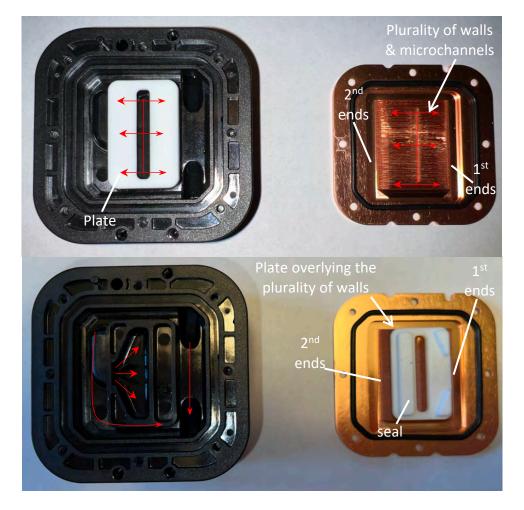




'284 Patent Claim	Comparison to Tamriel Device
1[a]. a plurality of spaced- apart walls defining a corresponding plurality of microchannels having respective first ends and second ends;	The Tamriel Device literally includes more than one spaced-apart wall and thus satisfies the plurality limitation. For example, the Tamriel Device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown at right.  As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."



'284 Patent Claim	Comparison to Tamriel Device
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The lower right image shows the plate positioned over the plurality of walls and partially closing off the microchannels.



#### '284 Patent Claim

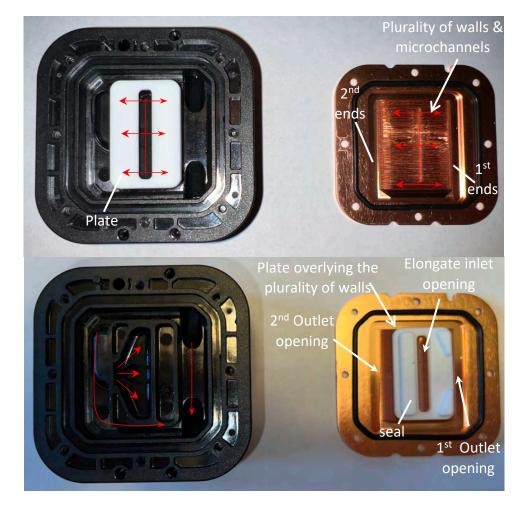
#### **Comparison to Tamriel Device**

1[c]. an elongate *inlet*opening in fluid

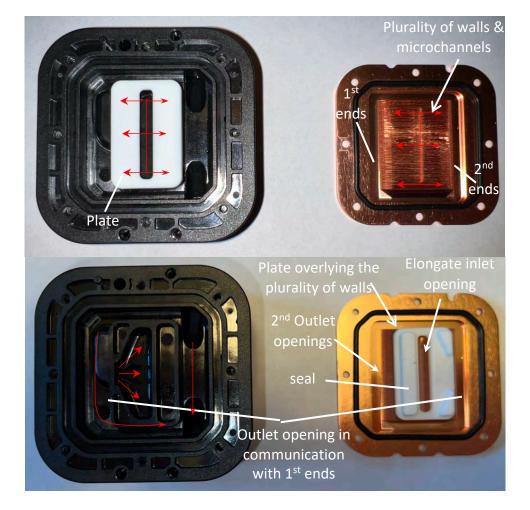
communication with each of
the microchannels, wherein
an inlet flow path to each
respective microchannel is
positioned between the
respective first ends and
second ends;

The lower right image shows the plate defines an elongate inlet opening oriented transversely to the walls and in fluid communication with each of the microchannels. The lower right image shows the plate positioned over the walls.

The lower left image also shows that the elongate inlet opening is in fluid communication with each of the plurality of micro channels at a position between the first ends of the microchannels and the second ends of the microchannels, defining an inlet flow path (indicated by central red arrow) to each microchannel, as claimed, between the first ends and the second ends of the microchannels.



'284 Patent Claim	Comparison to Tamriel Device
	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown at lower left.
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	When the plate is positioned over the fins (e.g., lower right), the indicated fluid outlet openings are positioned at each of the microchannel first ends, and the opposite outlet openings are positioned at each of the microchannel second ends.  Each fluid outlet opening is defined by the edge of the plate, as shown in FIG. 5. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)

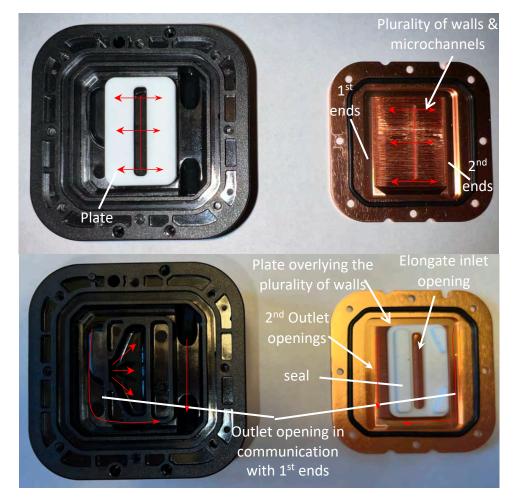


#### '284 Patent Claim

1[d][1]. wherein apath from each of the microchannel first ends is positioned laterally outward of the plate relative to the *inlet flow path* to the respective microchannel,

#### **Comparison to Tamriel Device**

Fluid exiting each microchannel first end (lower corresponding outlet flow left and right) follows an outlet flow path (indicated by bent red arrow at lower right) positioned laterally outward of the plate relative to the inlet flow path (central red line over fins, top right) that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red line (top left).



#### '284 Patent Claim

wall relative to the plurality

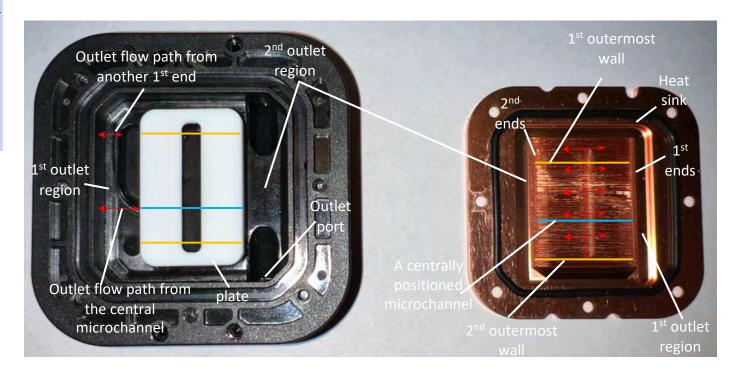
of microchannels,

#### 1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost

#### **Comparison to Tamriel Device**

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image.

The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

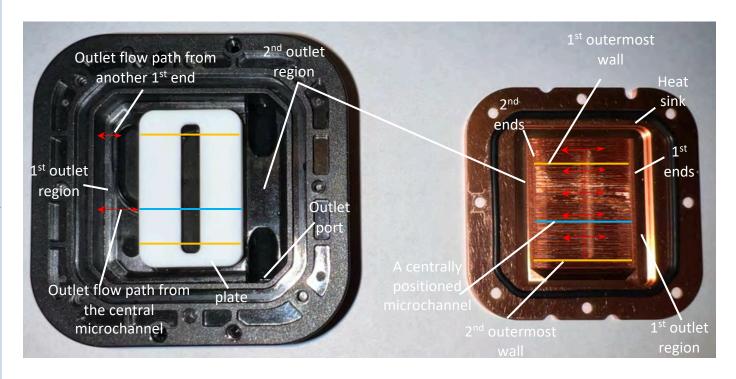


#### '284 Patent Claim

#### **Comparison to Tamriel Device**

1[d][3]. wherein the outlet flow path from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

As shown in the image at left and explained more fully on the next page with the aid of a CAD rendering, the outlet flow path from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall.

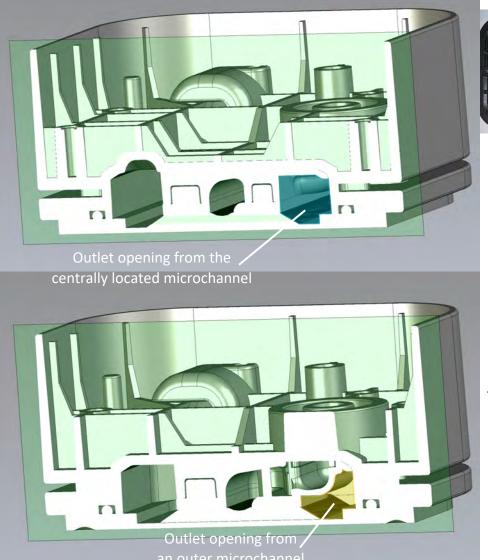


#### '284 Patent Claim

#### **Comparison to Tamriel Device**

1[d][3]. wherein *the outlet flow path* from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than *the outlet flow path* from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

The top left image and the bottom left image are cross-sectional views of the Tamriel Device taken parallel the identified centrally positioned microchannel and a microchannel adjacent an outermost wall ("outer microchannel") identified on the previous page. The blue shaded area in the top left image shows the outlet opening from the centrally located microchannel. The orange shaded area in the bottom left image shows the outlet opening from the "outer microchannel." At right, a comparison of the areas of the outlet openings is shown. In the middle right image, the areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the centrally positioned microchannel that remains when the area of the opening from the outer microchannel is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally positioned microchannel is larger than the outlet opening from at least one of the outer microchannels. Accordingly, the outlet flow path from the central microchannel is larger than the outlet flow path from the "outer micrcochannel."





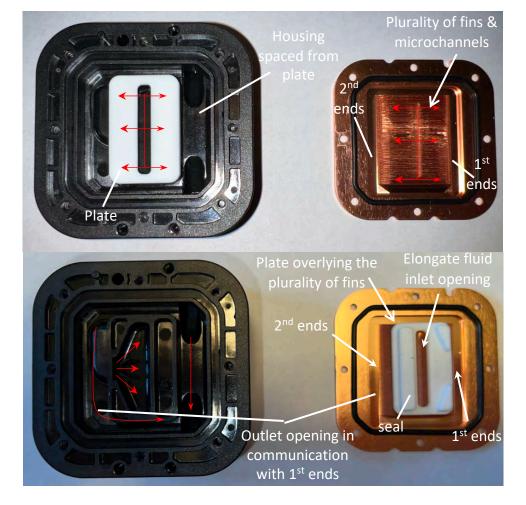
Comparison of outlet openings from the centrally located microchannel and at least one outer microchannel



The area by which the outlet opening from the centrally located microchannel is larger than the outlet opening from the identified outer microchannel



'284 Patent Claim	Comparison to Tamriel Device
1[e]. a housing positioned over and spaced apart from the plate,	When the plate is assembled with the housing (top left), portions of the housing are spaced from the plate (indicated bottom left). For example, the housing defines several intermediate recesses through which coolant flows. The plate and seal member occupies portions of the recesses, leaving other portions open to provide passages through which the coolant flows between the plate and the housing. Thus, the housing must be spaced from the plate.  See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).



#### '284 Patent Claim

1[e][1]. wherein the

housing has an inlet port

and an outlet port spaced apart from each other,

in fluid communication

respective outlet flow

port is in fluid

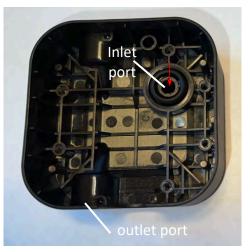
*path* from the

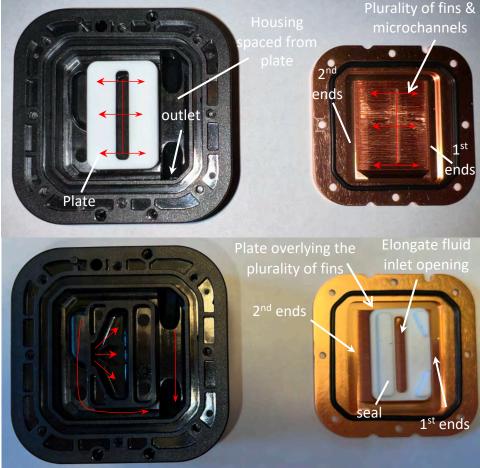
and

#### **Comparison to Tamriel Device**

The housing has an inlet port and an outlet port spaced apart from each other as shown at upper left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the lower left right image. (See also red arrows that depict flow of coolant through the device along the inlet passage and into the microchannels (indicated by outward arrows at top center and top right images)). For example, the central red line overtop the microchannels indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives coolant that passed through the indicated inlet port, and thus the inlet port is in fluid communication with the path of each flow entering into the microchannels.

wherein the inlet port is Similarly, the outlet port (indicated top left and with each respective inlet bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid *flow path* and the outlet communication with each outlet flow path from the communication with each microchannel first ends. The red arrows at lower left that are outward of the fins and microchannels indicate a flow of coolant after exhausting from the microchannel first ends as it flows toward the outlet microchannel first ends: port





#### '284 Patent Claim

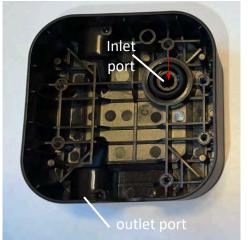
#### **Comparison to Tamriel Device**

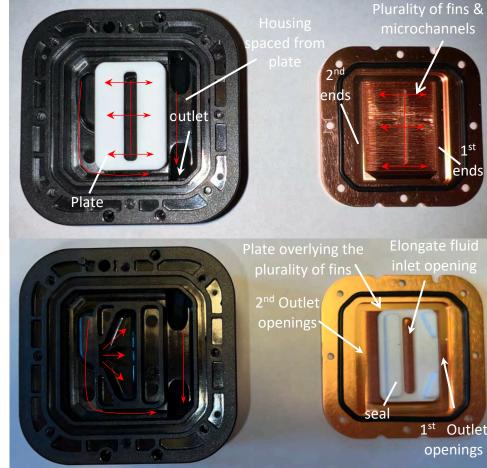
1[f]. *a seal* extending between the housing and the plate and separating *the inlet flow path* to each of the microchannels from the *outlet flow path* from each of the microchannel first ends,

The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap. The image at top middle shows the seal engaged with the housing and separating the inlet flow paths from the outlet flow paths.

1[f][1]. wherein each respective *inlet flow path* is split generally into two subflow paths, wherein one of the subflow paths extends outwardly toward the corresponding microchannel first end and passes outwardly of the plate along *the outlet flow path* from the respective microchannel first end.

The upper left and upper right images show that each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.



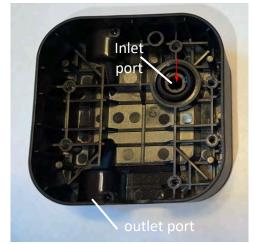


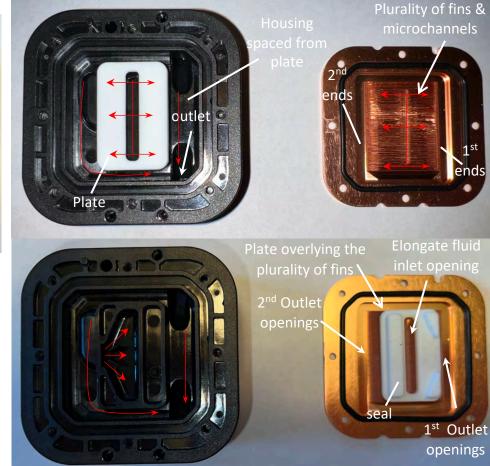
#### '284 Patent Claim

#### **Comparison to Tamriel Device**

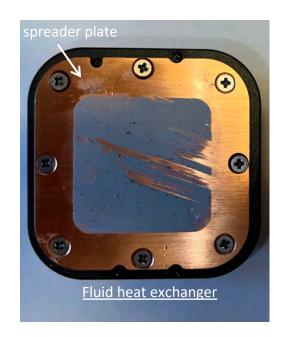
3. A fluid heat exchanger according to claim 1, wherein the two subflow paths are directed away from each other.

The top right image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the lower left image (outward red arrows).





'284 Patent Claim	Comparison to Tamriel Device
4. A fluid heat exchanger according to claim 1, further comprising a spreader plate, wherein the plurality of spaced-apart walls extends upwardly of the spreader plate, wherein the housing contacts the spreader plate.	As shown at left, the heat exchanger includes a spreader plate.  The image at bottom right shows that the plurality of spaced-apart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.  The upper left image also shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing.  ('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)





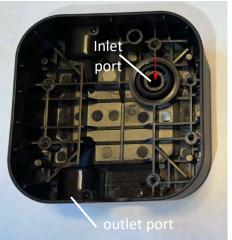
#### '284 Patent Claim

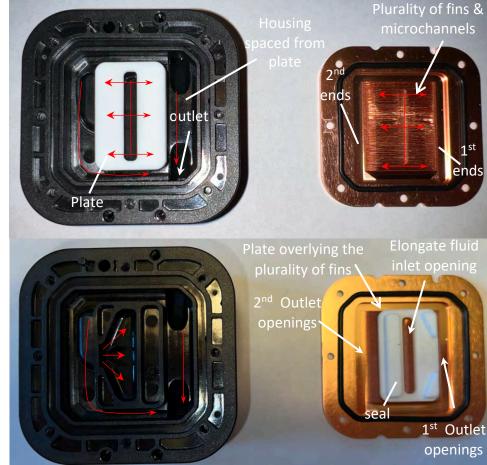
5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spaced-apart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

#### **Comparison to Tamriel Device**

The image at top right shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate is thermally coupled with each of the plate is thermally coupled with each wall.

As well, at least the top center image shows a portior of one or more outlet flow paths extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate (indicated by red arrows) on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.



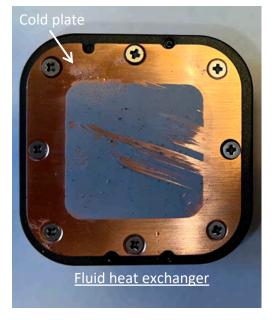


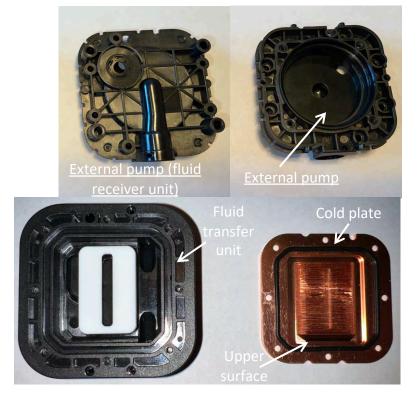
#### '284 Patent Claim

#### **Comparison to Tamriel Device**

15. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:

The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."





15[a]. a plurality of walls defining a corresponding plurality of microchannels extending from respective

first ends to respective

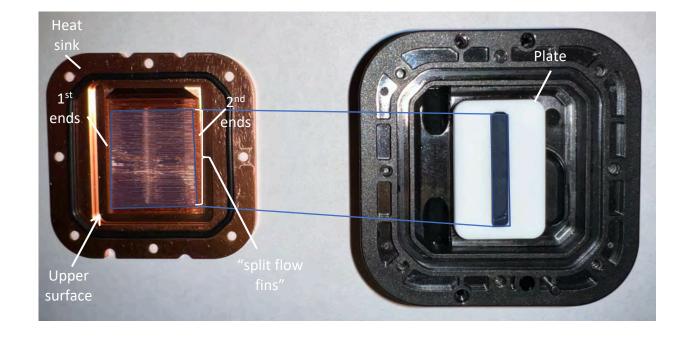
second ends;

'284 Patent Claim

#### **Comparison to Tamriel Device**

The Tamriel Device literally includes more than one wall and thus satisfies the plurality of walls limitation. For example, the Tamriel Device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown in the bottom Tamriel Device (detail view of upper right Tamriel Device).

As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

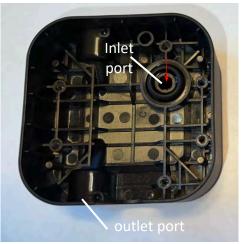


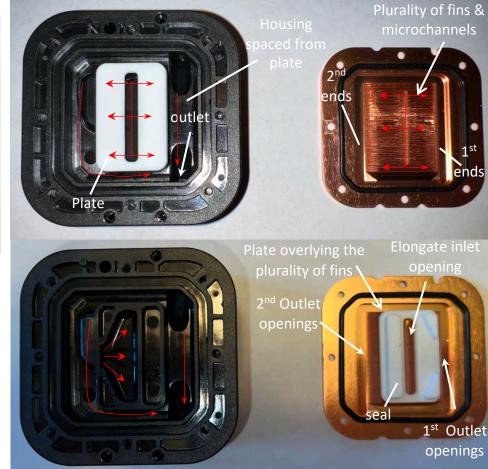
#### '284 Patent Claim

# 15[b]. an elongate *inlet* opening to the microchannels and defining an *inlet flow path* to each respective microchannel at a position between the respective first ends and the respective second ends;

#### **Comparison to Tamriel Device**

The lower right image shows the plate defines an elongate inlet that opens to the microchannels and that defines an inlet flow path to each microchannel. The elongate inlet is oriented transversely to the walls. The red central arrows in the top right image show that the elongate inlet is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed. The lower right image shows the elongate inlet installed over the microchannels.





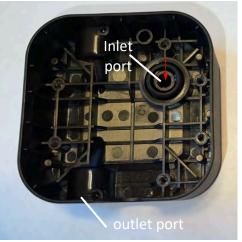
#### '284 Patent Claim

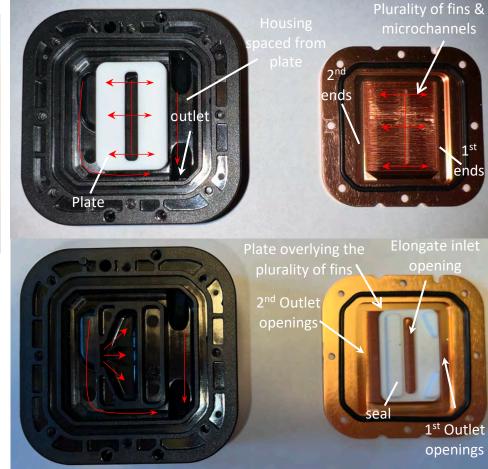
15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow path and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective *inlet flow path* and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end;

#### **Comparison to Tamriel Device**

The image at top center shows the claimed plate and the image at bottom right shows the claimed plate when it is positioned over the plurality of walls, closing off the plurality of microchannels.

The top center image shows the inlet flow paths, as well as the outlet flow paths positioned outward of the plate, extending from the microchannel first ends and from the microchannel second ends. The plate overlies the walls and closes off the plurality of microchannels between the inlet flow paths (central red arrow) and the outlet flow paths (red arrows positioned laterally outward of the plate).





#### '284 Patent Claim

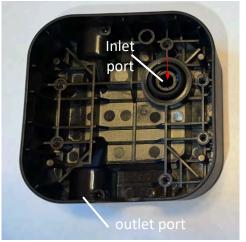
#### **Comparison to Tamriel Device**

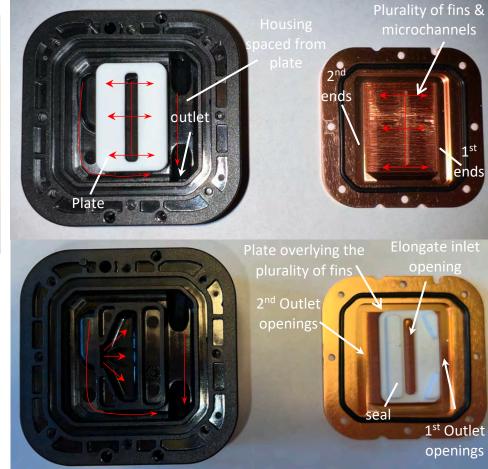
15[d]. a housing positioned over and spaced apart from the plate, wherein the housing has an inlet port and an outlet port spaced apart from each other; and

The top center image shows the plate and seal engaged with the housing. The upper left image shows the housing and the lower right image shows the plate overtop the walls of the heat spreader. As indicated by the curved red arrow at top center, the housing is spaced from the plate, defining a gap through which coolant can flow from the ends of the microchannels to the outlet port (top left). Accordingly, the housing is spaced from the plate.

The upper left image shows the housing's inlet

port.



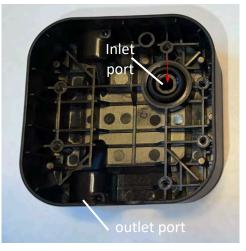


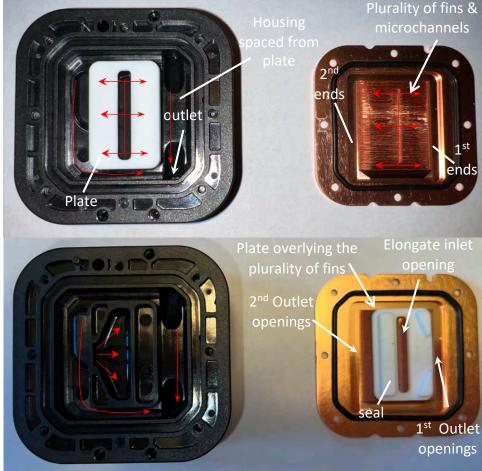
#### '284 Patent Claim

15[e]. a seal extending between the housing and the plate and separating the inlet flow path to each respective microchannel from both corresponding outlet flow paths from the respective microchannel, wherein each respective inlet each respective flow path splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow paths extends outwardly toward the corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding microchannel second end, wherein the subflow path toward the microchannel first end passes from the respective first end along the corresponding outlet flow path e, wherein the outlet flow path from a centrally located first end is larger than the outlet flow path from a first end spaced apart from the centrally located first end.

#### **Comparison to Tamriel Device**

The lower right image shows the claimed seal that extends between the plate and the housing, and the top center image shows the seal installed to separate the inlet flow paths from the outlet flow paths (red arrows). As indicated by a comparison of the top center and lower left images, the seal separates the inlet flow paths from the outlet flow paths. The top center and top right images show that each inlet flow path splits into two subflow paths after entering the microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The top center image also shows that the subflow of coolant directed toward the first end exits from the microchannel along that microchannel's first outlet flow path (Lshaped red arrow), and that the subflow of coolant directed toward the second end exits from the microchannel along that microchannel's second outlet flow path (straight red arrow).





#### '284 Patent Claim

*flow path* from a centrally

located first end is larger

than the outlet flow path

from the centrally located

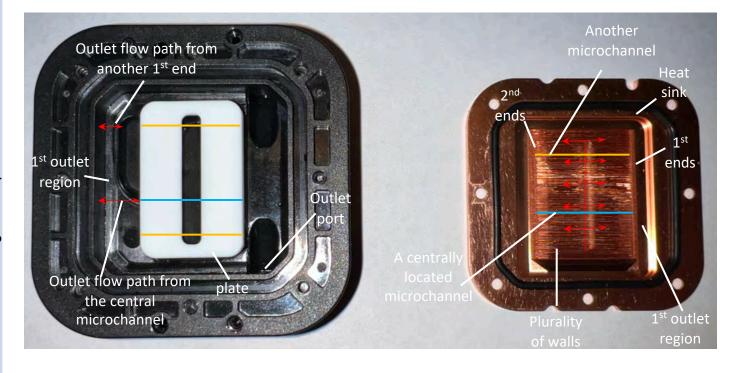
first end.

#### **Comparison to Tamriel Device**

The right image shows that the Tamriel Device includes a centrally located microchannel (blue line)and its first end. The right image also shows that the Tamriel Device includes a microchannel (orange line) spaced apart from the central microchannel, and this microchannel also has a first end spaced from the first end of the central 15[e][1]. wherein the outlet microchannel. (This is true regardless of whether the microchannels arise from the "split flow fins" or some other selected group of fins.) from a first end spaced apart

> As well, each microchannel has an outlet opening to the first outlet region. As indicated by the red arrows superimposed on the right image, the outlet opening from the identified centrally located microchannel is larger than the outlet opening from the other identified microchannel.

[continued on next page]



# The outlet flow path from the central first end is larger than the outlet flow path from the other first end. The top left image is a cross-sectional view of the Tamriel Device taken parallel the identified central microchannel, and the bottom left image is a similar cross-sectional view taken parallel to the other identified microchannel. The blue shaded area at top left shows the outlet opening from the central

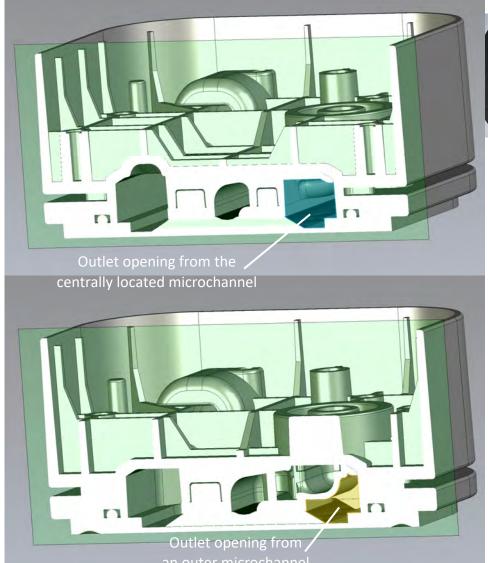
flow path from a centrally located first end is larger than the outlet flow path from a first end spaced apart from the centrally located first end.

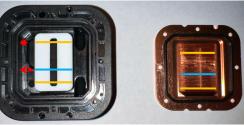
A comparison of the areas of the outlet openings is shown at far right. In the middle right image, the areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the central first end that remains when the area of the opening from the other first end is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally first end is larger than the outlet opening from the other first end.

Accordingly, the outlet flow path from the central first end is larger than the outlet flow path from the other first end.

first end and the orange shaded area at bottom left

shows the outlet opening from the other first end.





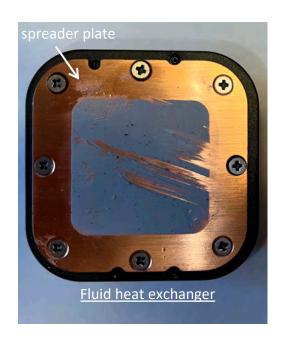
Comparison of outlet openings from the centrally located microchannel and at least one outer microchannel

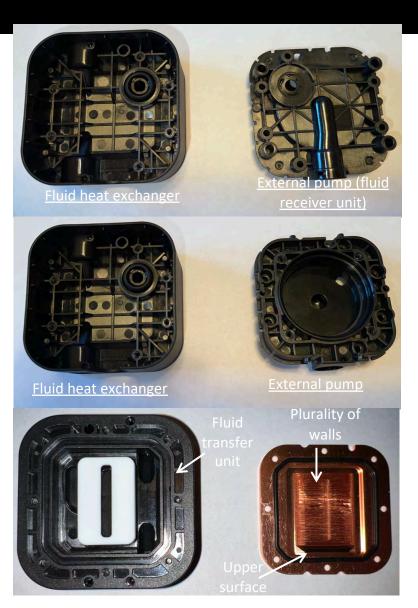


The area by which the outlet opening from the centrally located microchannel is larger than the outlet opening from the identified outer microchannel



'284 Patent Claim	Comparison to Tamriel Device
19. A fluid heat exchanger according to claim 15, further comprising a spreader plate, wherein the plurality of walls extends upwardly of the spreader plate and the	As shown at left and bottom right, the heat exchanger includes a spreader plate.  The image at bottom right shows that the plurality of spaced-apart walls (whichever interpretation of "plurality" is selected) extend upwardly of the spreader plate.  The image at left also shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing.
	('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)

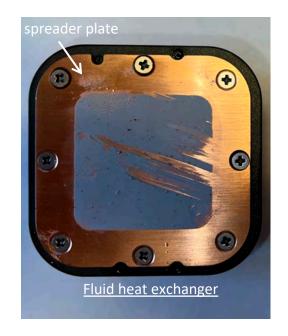




#### '284 Patent Claim Comparison to Tamriel Device

20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls.

The image at bottom right shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.

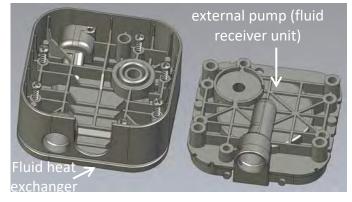


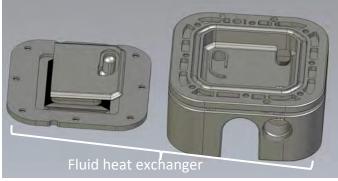


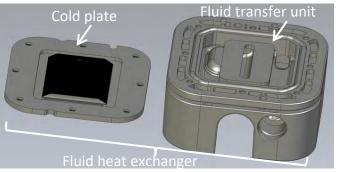
# Exhibit B-7

CoolIT's Tamriel Device (represented by CAD files)

**Comparison to Tamriel Device** '284 Patent Claim The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 1. A fluid heat exchanger for unit and the cold plate together form a fluid heat cooling an electronic device, exchanger. The assembled fluid transfer unit and the heat exchanger cold plate includes a component that transfers heat comprising: from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."



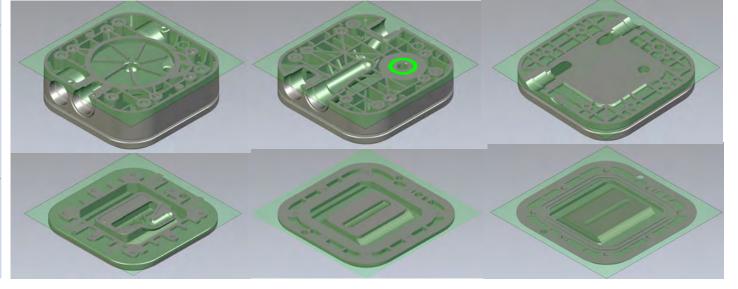




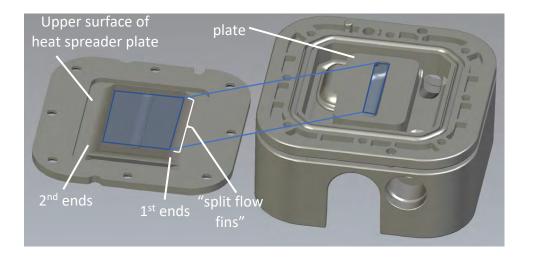


'284 Patent Claim **Comparison to Tamriel Device** The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 1. A fluid heat exchanger for unit and the cold plate together form a fluid heat cooling an electronic device, exchanger. The assembled fluid transfer unit and the heat exchanger cold plate includes a component that transfers heat comprising: from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."

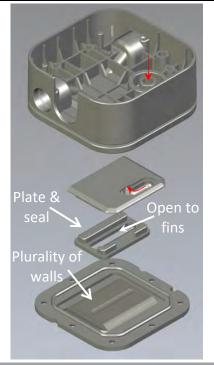
cooling an electronic device, the heat exchanger comprising:  exchanger. The assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the	'284 Patent Claim	Comparison to Tamriel Device
transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the	1. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:	The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the
* * *		component."

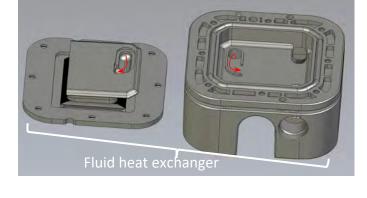


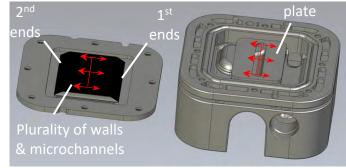
'284 Patent Claim	Comparison to Tamriel Device
1[a]. a plurality of spaced- apart walls defining a corresponding plurality of microchannels having respective first ends and second ends;	The Tamriel Device literally includes more than one spaced-apart wall and thus satisfies the plurality limitation. For example, the Tamriel Device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the several spaced apart walls define a plurality of microchannels that correspond to the spaced-apart walls. As each microchannel extends from a first end to a second end, each in the plurality of microchannels has a respective first end and second end, as shown at right.  As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split flow fins." Thus, the "split flow fins" constitute a claimed "plurality of spaced-apart walls."

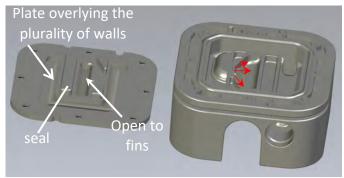


'284 Patent Claim	Comparison to Tamriel Device
1[b]. a plate positioned over the plurality of walls and partially closing off the plurality of microchannels;	The lower right image shows the plate positioned over the plurality of walls and partially closing off the microchannels.









#### '284 Patent Claim

1[c]. an elongate *inlet*opening in fluid

communication with each of
the microchannels, wherein

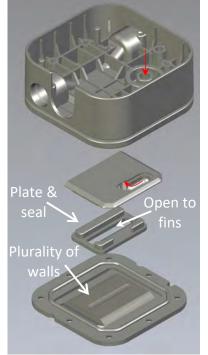
an inlet flow path to each
respective microchannel is
positioned between the
respective first ends and

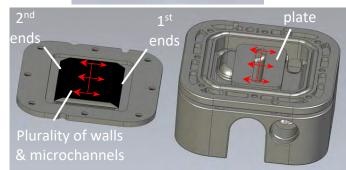
second ends;

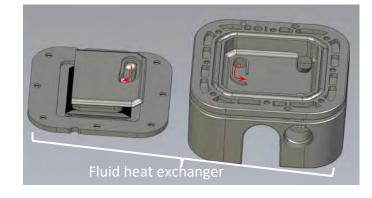
#### **Comparison to Tamriel Device**

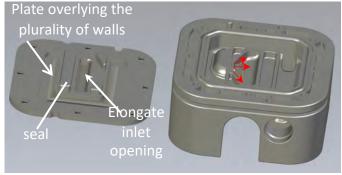
The upper left image shows the plate defines an elongate inlet opening oriented transversely to the walls and in fluid communication with each of the microchannels. The lower right image shows the plate positioned over the walls.

The lower left image also shows that the elongate inlet opening is in fluid communication with each of the plurality of micro channels at a position between the first ends of the microchannels and the second ends of the microchannels, defining an inlet flow path (indicated by central red arrow) to each microchannel, as claimed, between the first ends and the second ends of the microchannels.

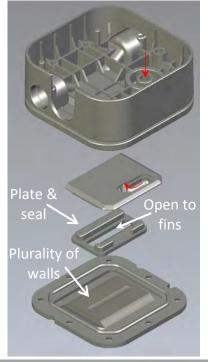


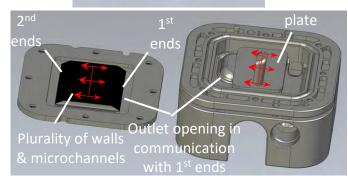


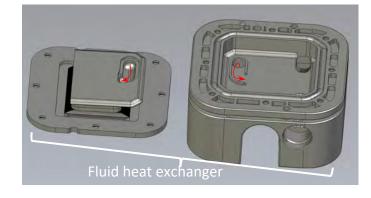


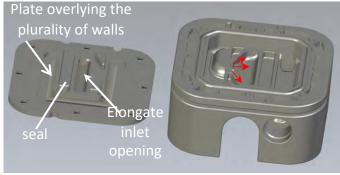


'284 Patent Claim	Comparison to Tamriel Device
	Each microchannel has a first end and an opposed second end. The fluid heat exchanger has an outlet opening in fluid communication with each of the microchannel first ends, as shown at lower left.
1[d]. an <i>outlet opening</i> in fluid communication with each of the microchannel first ends,	When the plate is positioned over the fins (e.g., lower right), the indicated fluid outlet openings are positioned at each of the microchannel first ends, and the opposite outlet openings are positioned at each of the microchannel second ends.
	Each fluid outlet opening is defined by the edge of the plate, as shown in FIG. 5. ('284, 5:13-55, 6:33-40, and Fig. 1 - ref 124.)







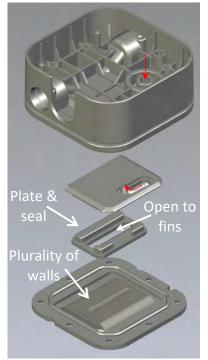


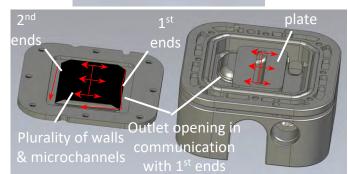
#### '284 Patent Claim

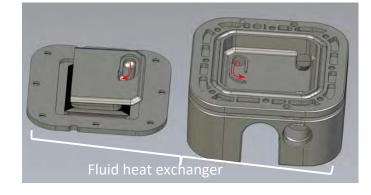
1[d][1]. wherein a corresponding outlet flow path from each of the microchannel first ends is positioned laterally outward of the plate relative to the inlet flow path to the respective microchannel,

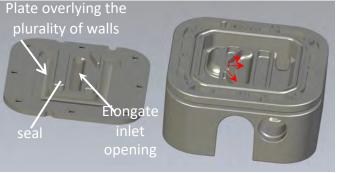
#### **Comparison to Tamriel Device**

Fluid exiting each microchannel first end (lower left) follows an outlet flow path (indicated by bent red arrow at lower left) positioned laterally outward of the plate relative to the inlet flow path (central red line over fins) that the fluid follows to enter the microchannel. The inlet flow paths pass through the elongate inlet opening, indicated by the central red line.











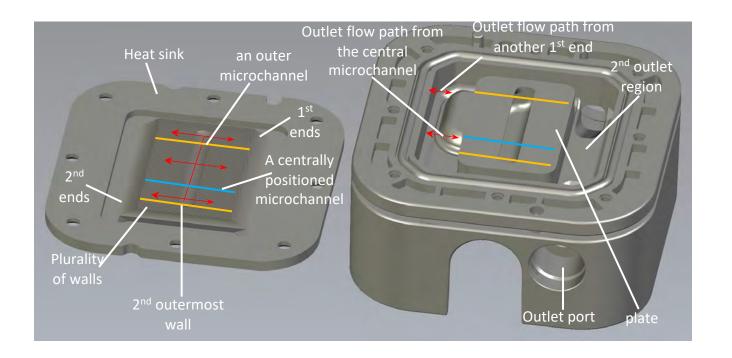
#### '284 Patent Claim

#### **Comparison to Tamriel Device**

1[d][2]. wherein the plurality of spaced-apart walls comprises a first outermost wall and a second outermost wall spaced apart from and opposite the first outermost wall relative to the plurality of microchannels,

The previously identified fins that are the claimed "plurality of spaced-apart walls have a first outermost wall and a second outermost wall, as indicated in the upper right image.

The first and second outermost walls are spaced apart from and opposite each other relative to the plurality of microchannels defined by the selected plurality of walls.

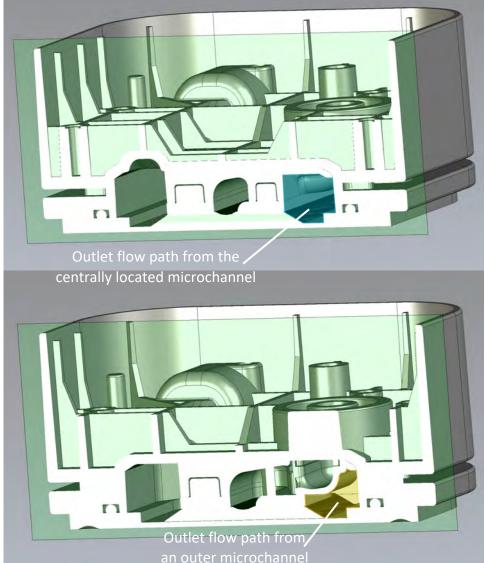


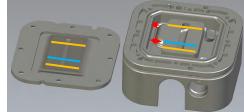
#### '284 Patent Claim

#### **Comparison to Tamriel Device**

1[d][3]. wherein the outlet flow path from a centrally positioned microchannel first end positioned between the first outermost wall and the second outermost wall is larger than the outlet flow path from another microchannel first end positioned adjacent the first outermost wall, the second outermost wall, or both;

The top left image and the bottom left image are cross-sectional views of the Tamriel Device taken parallel the identified centrally positioned microchannel and a microchannel adjacent an outermost wall ("outer microchannel") identified on the previous page. The blue shaded area in the top left image shows the outlet opening from the centrally located microchannel. The orange shaded area in the bottom left image shows the outlet opening from the "outer microchannel." At right, a comparison of the areas of the outlet openings is shown. In the middle right image, the areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the centrally positioned microchannel that remains when the area of the opening from the outer microchannel is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally positioned microchannel is larger than the outlet opening from at least one of the outer microchannels. Accordingly, the outlet flow path from the central microchannel is larger than the outlet flow path from the "outer micrcochannel."





Comparison of outlet flow paths from the centrally located microchannel and at least one outer microchannel

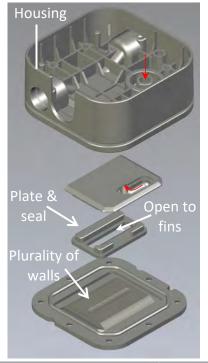


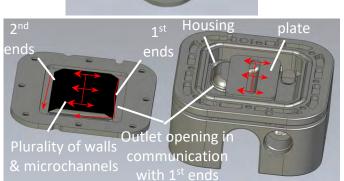
The area by which the outlet flow path from the centrally located microchannel is larger than the outlet flow path from the identified outer microchannel

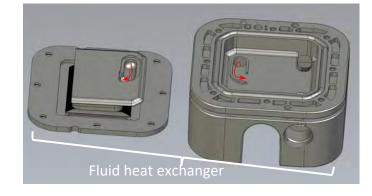


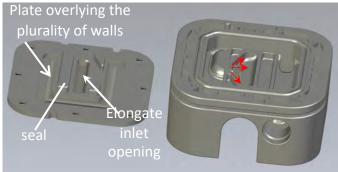
158

'284 Patent Claim	Comparison to Tamriel Device
1[e]. a housing positioned over and spaced apart from the plate,	When the plate is assembled with the housing (top left and bottom left), portions of the housing are spaced from the plate (indicated bottom left). For example, the housing defines several intermediate recesses through which coolant flows. The plate and seal member occupies portions of the recesses, leaving other portions open to provide passages through which the coolant flows between the plate and the housing. Thus, the housing must be spaced from the plate.  See also spec which describes that the seal 130 can be installed as a portion of the plate, and the seal urges against the housing. (Spec. 6:52-55, 7:5-6, FIG. 1 - ref 130, Fig. 2 - ref 230).









#### '284 Patent Claim

1[e][1]. wherein the

housing has an inlet port

and an outlet port spaced apart from each other,

wherein the inlet port is

in fluid communication

*flow path* and the outlet

respective outlet flow

microchannel first ends:

port is in fluid

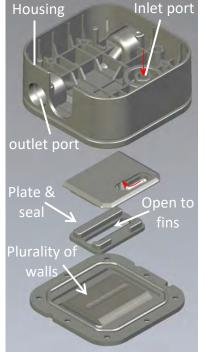
*path* from the

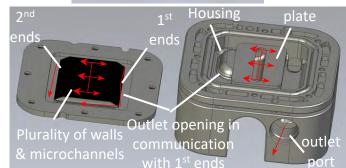
and

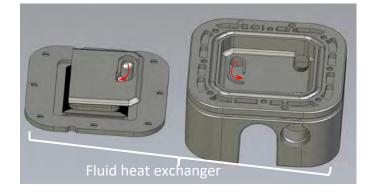
#### **Comparison to Tamriel Device**

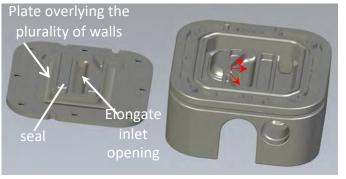
The housing has an inlet port and an outlet port spaced apart from each other as shown at upper left. The inlet port is in fluid communication with each respective inlet flow path to each microchannel, as depicted in the lower left right image. (See also red arrows that depict flow of coolant through the device along the inlet passage and into the microchannels (indicated by outward arrows at lower left image)). For example, the central red line overtop the microchannels indicates a flow of coolant overtop the fins and the intersection of each horizontal arrow with the central arrow depicts a point of entry to each microchannel. Each microchannel receives coolant that passed through the indicated inlet port, and thus the inlet port is in fluid communication with the path of each flow entering into the microchannels.

Similarly, the outlet port (indicated top left and with each respective inlet bottom left) receives coolant that exhausts from each microchannel, and thus is in fluid communication with each outlet flow path from the communication with each microchannel first ends. The red arrows at lower left that are outward of the fins and microchannels indicate a flow of coolant after exhausting from the microchannel first ends as it flows toward the outlet port









#### '284 Patent Claim

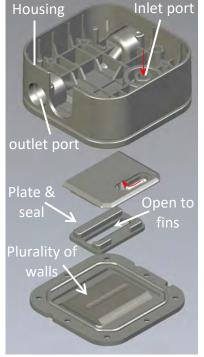
#### **Comparison to Tamriel Device**

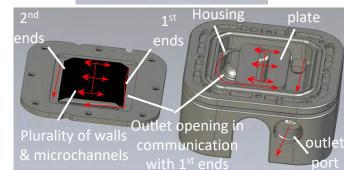
1[f]. *a seal* extending between the housing and the plate and separating *the inlet flow path* to each of the microchannels from the *outlet flow path* from each of the microchannel first ends,

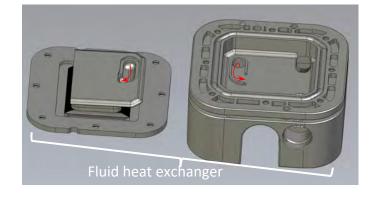
The lower right image shows the claimed seal positioned between the plate and the housing. The seal fills a gap between the plate and the housing to prevent leakage through the gap. The image at lower left shows the seal engaged with the housing and separating the inlet flow paths from the outlet flow paths.

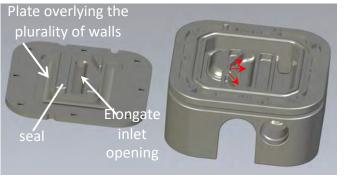
respective *inlet flow*path is split generally
into two subflow paths,
wherein one of the
subflow paths extends
outwardly toward the
corresponding
microchannel first end
and passes outwardly of
the plate along the outlet
flow path from the
respective microchannel
first end.

The lower left image shows each flow of coolant entering a microchannel bifurcates (splits) into two outwardly directed subflows. Accordingly, the path that each subflow of coolant follows is a subflow path, and thus each inlet flow path splits into two subflow paths that are directed outwardly from each other toward the opposite ends of the microchannel. Each subflow flows along the microchannel until it reaches the end of the microchannel toward which it flows. As the subflow exits the microchannel, it flows along the outlet flow path from that microchannel and toward the housing outlet port.

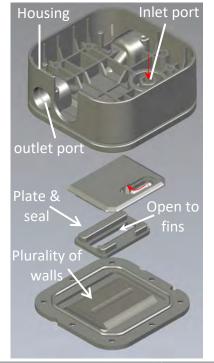


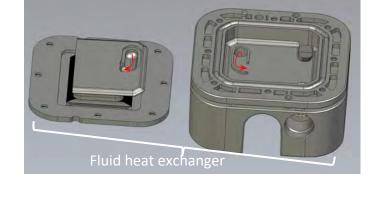


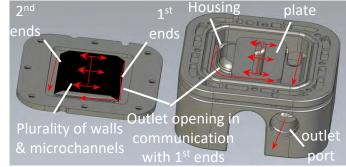


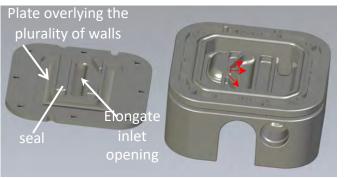


# 7284 Patent Claim Comparison to Tamriel Device The lower left image shows each flow of coolant entering a microchannel bifurcates (splits) into two subflows as described above. Within each microchannel, the subflow paths are directed outwardly away from each other, as indicated in the lower left image (outward red arrows).

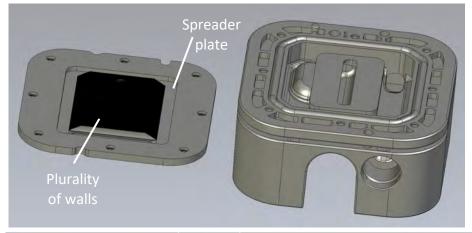


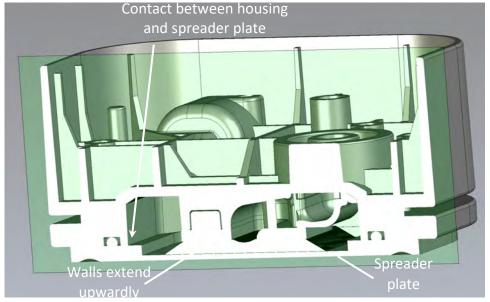






'284 Patent Claim **Comparison to Tamriel Device** As shown at top right, the heat exchanger includes a spreader plate. The image also shows a cross-sectional view of the fluid heat exchanger in a plane parallel to the 4. A fluid heat exchanger plurality of spaced apart walls. As that image according to claim 1, further shows, the plurality of spaced-apart walls comprising a spreader plate, (whichever interpretation of "plurality" is selected) wherein the plurality of extend upwardly of the spreader plate. That image spaced-apart walls extends also shows that the housing contacts the spreader upwardly of the spreader plate, e.g., a side wall of the housing extends plate, wherein the housing downwardly over the walls and contacts the contacts the spreader plate. spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing. ('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)





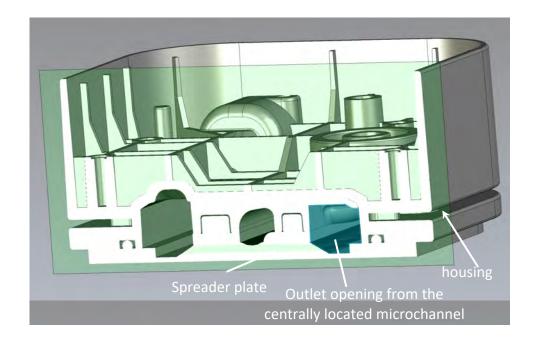
#### '284 Patent Claim Compa

5. A fluid heat exchanger according to claim 4, wherein the spreader plate is thermally coupled with each of the plurality of spaced-apart walls and wherein a portion of one or more of the *outlet flow paths* extends between the plate positioned over the plurality of walls and the housing before the respective one or more flow paths pass through the outlet port.

#### **Comparison to Tamriel Device**

The image to the right shows the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate is thermally coupled with each of the plate is thermally coupled with each wall.

As well, the image shows a portion of one or more outlet flow paths extending between the housing and the plate that overlies the walls. As fluid exits the microchannels' ends, it flows through the gap between the housing and the plate (indicated by blue shading) on its way toward the outlet port defined by the housing. Thus, at least one of the outlet flow paths extends between the plate and the housing before it passes through the outlet port.



#### '284 Patent Claim

comprising:

#### **Comparison to Tamriel Device**

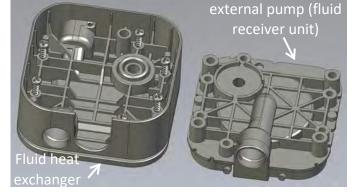
The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer

transfers heat from a heat source to a cooling liquid

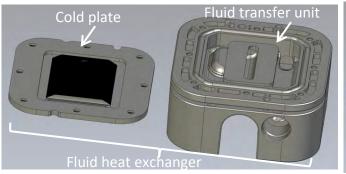
circulated by a pump that is external to the

component."

unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 15. A fluid heat exchanger unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and for cooling an electronic cold plate includes a component that transfers heat device, the heat exchanger from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that







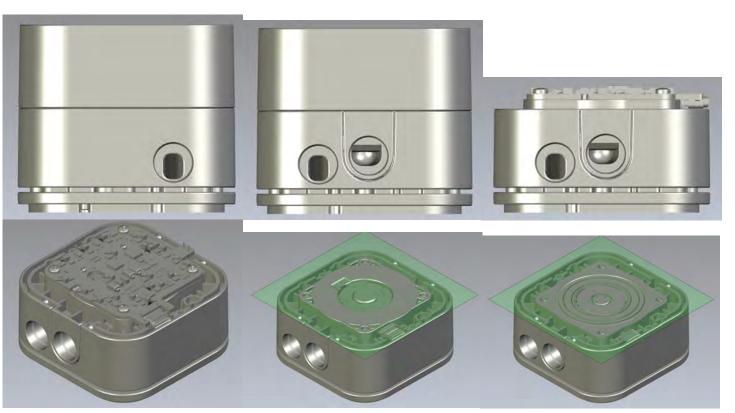


'284 Patent Claim

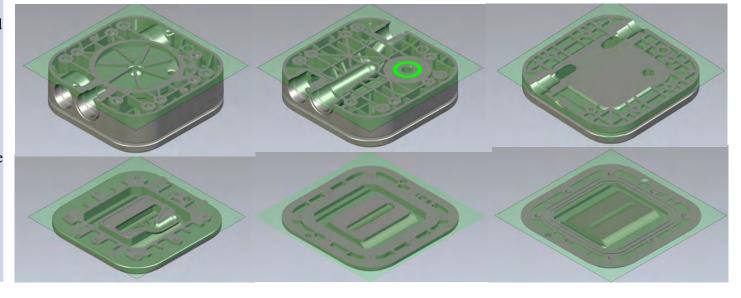
#### **Comparison to Tamriel Device**

15. A fluid heat exchanger for cooling an electronic device, the heat exchanger comprising:

The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and cold plate includes a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."



#### '284 Patent Claim **Comparison to Tamriel Device** The Tamriel Device is a modular heat-exchange system having a fluid receiver unit, a fluid transfer unit, and a cold plate coupled with the fluid transfer unit. In the embodiment shown, the fluid receiver unit includes a pump and is separable from the fluid transfer unit and the cold plate. The fluid transfer 15. A fluid heat exchanger unit and the cold plate together form a fluid heat exchanger. The assembled fluid transfer unit and for cooling an electronic cold plate includes a component that transfers heat device, the heat exchanger comprising: from a heat source to a cooling liquid circulated by a pump that is external to the component. For example, the Tamriel Device device has a cold plate and a housing that are separable from the fluid receiver unit which contains the pump. Thus, the Tamriel Device device includes "a component that transfers heat from a heat source to a cooling liquid circulated by a pump that is external to the component."

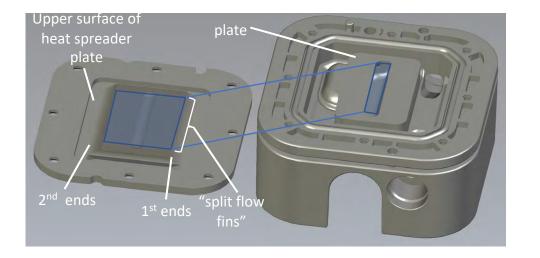


#### The Tamriel Device literally includes more than one wall and thus satisfies the plurality of walls limitation. For example, the Tamriel Device has several spaced-apart walls (e.g., each fin in the plurality of fins has no intervening solid structure between it and the next fin; right, shaded blue). The spacing between each pair of walls defines a microchannel (e.g., they define a "channel with a width up to 1 millimeter."). Accordingly, the 15[a]. a plurality of walls several spaced apart walls define a plurality of defining a corresponding microchannels that correspond to the spaced-apart plurality of microchannels walls. As each microchannel extends from a first extending from respective end to a second end, each in the plurality of first ends to respective microchannels has a respective first end and second second ends; end, as shown in the bottom Tamriel Device (detail view of upper right Tamriel Device). As shown to the right, a group of walls and microchannels are positioned beneath the opening (left) in the plate. Each fin in this group is exposed directly to liquid flowing from the opening through the plate. These fins are referred to herein as "split

**Comparison to Tamriel Device** 

flow fins." Thus, the "split flow fins" constitute a

claimed "plurality of spaced-apart walls."

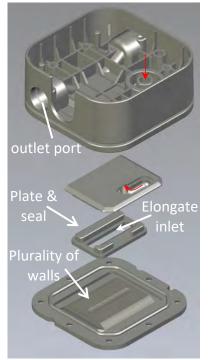


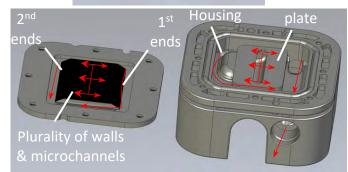
# The top I elongate and that microchannels and defining an *inlet flow path* to each respective microchannel at a position between the respective first ends and the respective second ends; The top I elongate and that microchannels in the bott in the bott in the bott in the channel of the channel shows in the shows in the shows in the shows in the channel shows in the shows in the channel shows in the chan

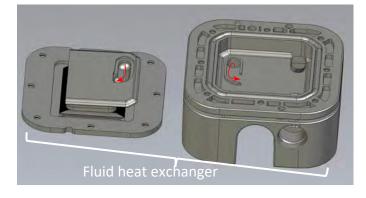
'284 Patent Claim

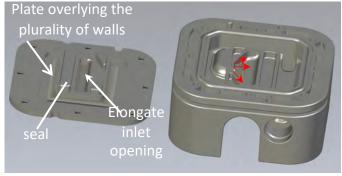
#### **Comparison to Tamriel Device**

The top left image shows the plate defines an elongate inlet that opens to the microchannels and that defines an inlet flow path to each microchannel. The elongate inlet is oriented transversely to the walls. The red central arrows in the bottom left image show that the elongate inlet is in fluid communication with each of the plurality of channels at a position between the first ends of the channels and the second ends of the channels, defining an inlet flow path to each channel as claimed. The lower right image shows the elongate inlet installed over the microchannels.









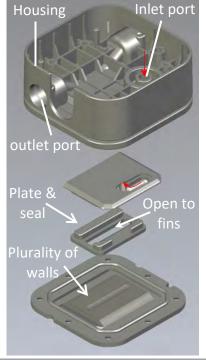
#### '284 Patent Claim

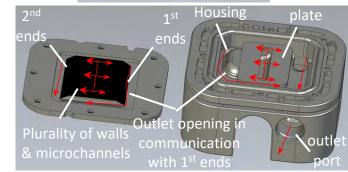
15[c]. a plate positioned over the plurality of walls to close off the plurality of microchannels between each respective elongate inlet flow path and a corresponding outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding first end, and wherein the plate is positioned over the plurality of walls to close off the plurality of microchannels between each respective *inlet flow path* and a corresponding opposed outlet flow path positioned outward of the plate and extending from the respective microchannel adjacent the corresponding second end;

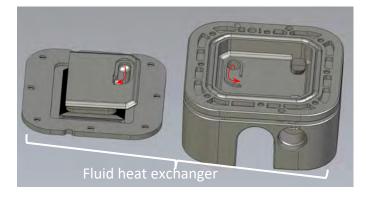
#### **Comparison to Tamriel Device**

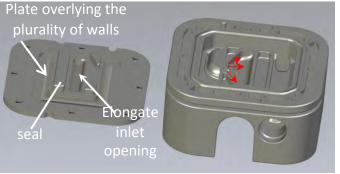
The image at top left shows the claimed plate and the image at bottom right shows the claimed plate when it is positioned over the plurality of walls, closing off the plurality of microchannels.

The lower left image shows the inlet flow paths, as well as the outlet flow paths positioned outward of the plate, extending from the microchannel first ends and from the microchannel second ends. The plate overlies the walls and closes off the plurality of microchannels between the inlet flow paths (central red arrow) and the outlet flow paths (laterally outward red arrows).

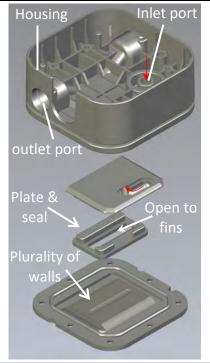


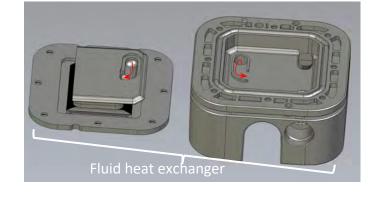


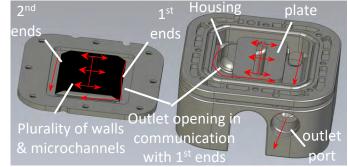


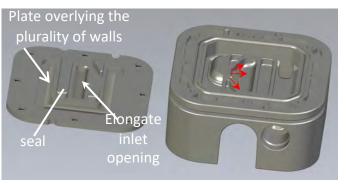


#### '284 Patent Claim **Comparison to Tamriel Device** The lower left image shows the plate and seal engaged with the housing. The lower right image shows the housing as well as the plate overtop the walls of the heat spreader. As 15[d]. a housing positioned over and spaced apart from the indicated by the curved red arrow at lower left, the housing is spaced from the plate, defining a plate, wherein the housing has an inlet port and an outlet port gap through which coolant can flow from the ends of the microchannels to the outlet port spaced apart from each other; (lower left). Accordingly, the housing is spaced and from the plate. The upper left image shows the housing's inlet port







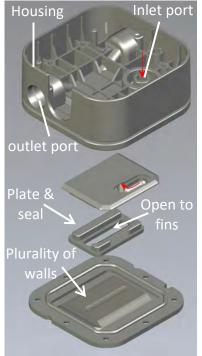


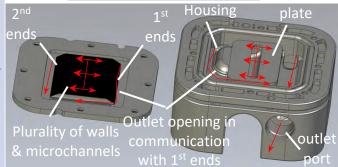
#### '284 Patent Claim

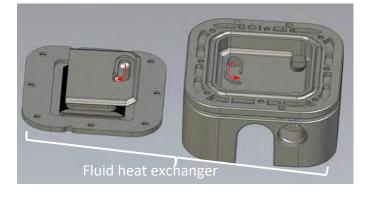
#### **Comparison to Tamriel Device**

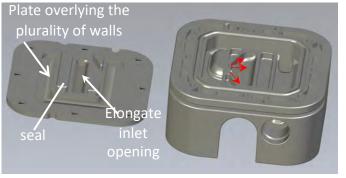
15[e]. a seal extending between the housing and the plate and separating the inlet flow path to each respective microchannel from both corresponding outlet flow *paths* from the respective microchannel, wherein each respective inlet each respective flow path splits generally into two subflow paths after entering the corresponding microchannel, wherein one of the two subflow corresponding microchannel first end and the other of the two subflow paths extends outwardly toward the corresponding the subflow path toward the the respective first end along the corresponding outlet flow path e, centrally located first end is larger than the outlet flow path from a first end spaced apart from the centrally located first end.

The lower right image shows the claimed seal that extends between the plate and the housing, and the lower left shows the seal installed to separate the inlet flow paths from the outlet flow paths (red arrows). As shown at lower left, the seal separates the inlet flow paths from the outlet flow paths. The lower left image shows that each inlet flow path paths extends outwardly toward the splits into two subflow paths after entering the microchannel and that one of the two subflow paths extends outwardly toward the microchannel's first end and the other subflow path extends outwardly toward the microchannel's second end. The lower microchannel second end, wherein left image also shows that the subflow of coolant directed toward the first end exits from the microchannel first end passes from microchannel along that microchannel's first outlet flow path (L-shaped red arrow), and that the subflow of coolant directed toward the second end exits from wherein the outlet flow path from a the microchannel along that microchannel's second outlet flow path (straight red arrow).

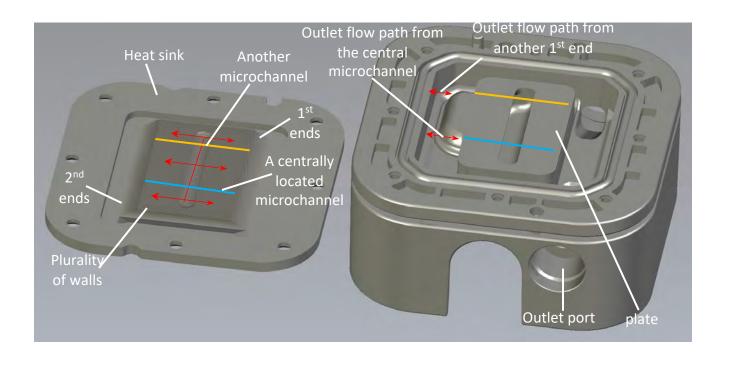








#### '284 Patent Claim **Comparison to Tamriel Device** The left image shows that the Tamriel Device includes a centrally located microchannel (blue line)and its first end. The left image also shows that the Tamriel Device includes a microchannel (orange line) spaced apart from the central microchannel, and this microchannel also has a first end spaced from the first end of the central 15[e][1]. wherein the outlet *flow path* from a centrally microchannel. (This is true regardless of whether located first end is larger the microchannels arise from the "split flow fins" or than the outlet flow path some other selected group of fins.) from a first end spaced apart from the centrally located As well, each microchannel has an outlet opening to the first outlet region. As indicated by the red first end. arrows superimposed on the right image, the outlet opening from the identified centrally located microchannel is larger than the outlet opening from the other identified microchannel. [continued on next page]

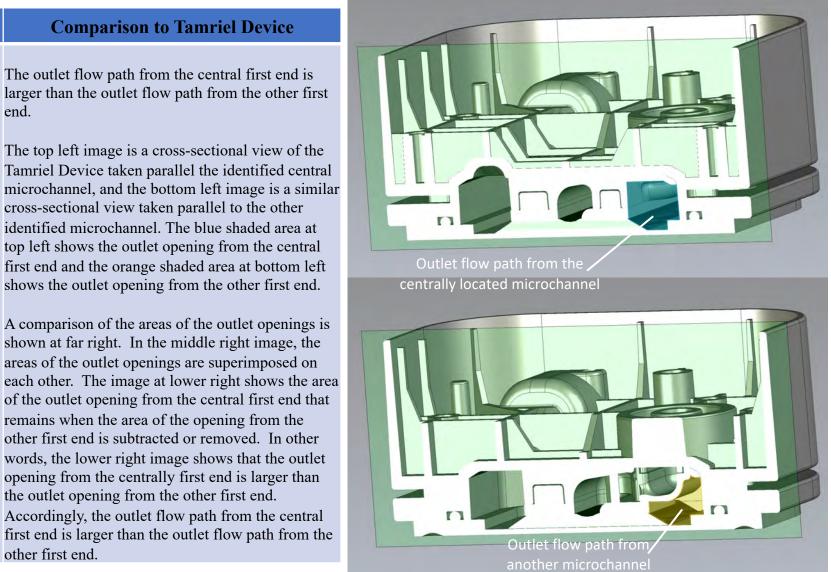


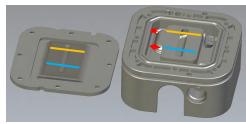
'284 Patent Claim **Comparison to Tamriel Device** The outlet flow path from the central first end is larger than the outlet flow path from the other first end. The top left image is a cross-sectional view of the Tamriel Device taken parallel the identified central

identified microchannel. The blue shaded area at top left shows the outlet opening from the central 15[e][1]. wherein the outlet *flow path* from a centrally first end and the orange shaded area at bottom left located first end is larger shows the outlet opening from the other first end. than the *outlet flow path* from a first end spaced apart from the centrally located first end.

A comparison of the areas of the outlet openings is shown at far right. In the middle right image, the areas of the outlet openings are superimposed on each other. The image at lower right shows the area of the outlet opening from the central first end that remains when the area of the opening from the other first end is subtracted or removed. In other words, the lower right image shows that the outlet opening from the centrally first end is larger than the outlet opening from the other first end. Accordingly, the outlet flow path from the central first end is larger than the outlet flow path from the other first end.

cross-sectional view taken parallel to the other





Comparison of outlet flow paths from the centrally located microchannel and another microchannel

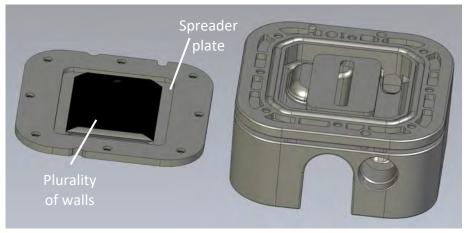


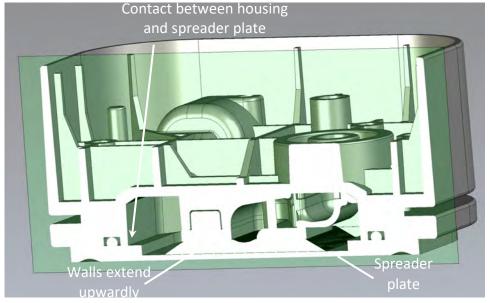
The area by which the outlet flow path from the centrally located microchannel is larger than the outlet flow path from the identified other microchannel



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'284 Patent Claim	Comparison to Tamriel Device
19. A fluid heat exchanger according to claim 15, further comprising a spreader	As shown at top right, the heat exchanger includes a spreader plate.  The image at bottom right shows a cross-sectional view of the fluid heat exchanger in a plane parallel to the plurality of spaced apart walls. As that image shows, the plurality of spaced-apart walls (whichever interpretation of "plurality" is selected)
walls extends upwardly of the spreader plate and the	extend upwardly of the spreader plate. That image also shows that the housing contacts the spreader plate, e.g., a side wall of the housing extends downwardly over the walls and contacts the spreader plate. The housing also has a number of studs into which screws are threaded to draw the spreader plate into contact with the housing.  ('284, 2:54-60, 7:20-30, FIGs. 2, 3, 4 and 5.)





# 20. A fluid heat exchanger according to claim 19, wherein the spreader plate is thermally coupled with each of the plurality of walls. Comparison to New Design The images to the right show the heat spreader plate having integrally formed walls extending upwardly, allowing heat to conductively flow from the heat spreader plate into each wall. Thus, the heat spreader plate is thermally coupled with each wall.

